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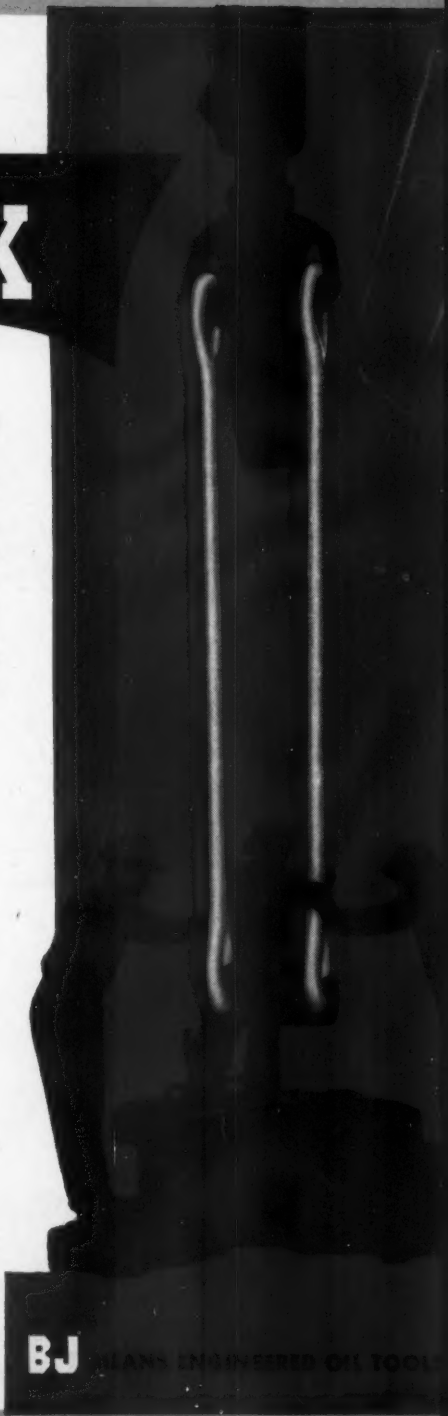

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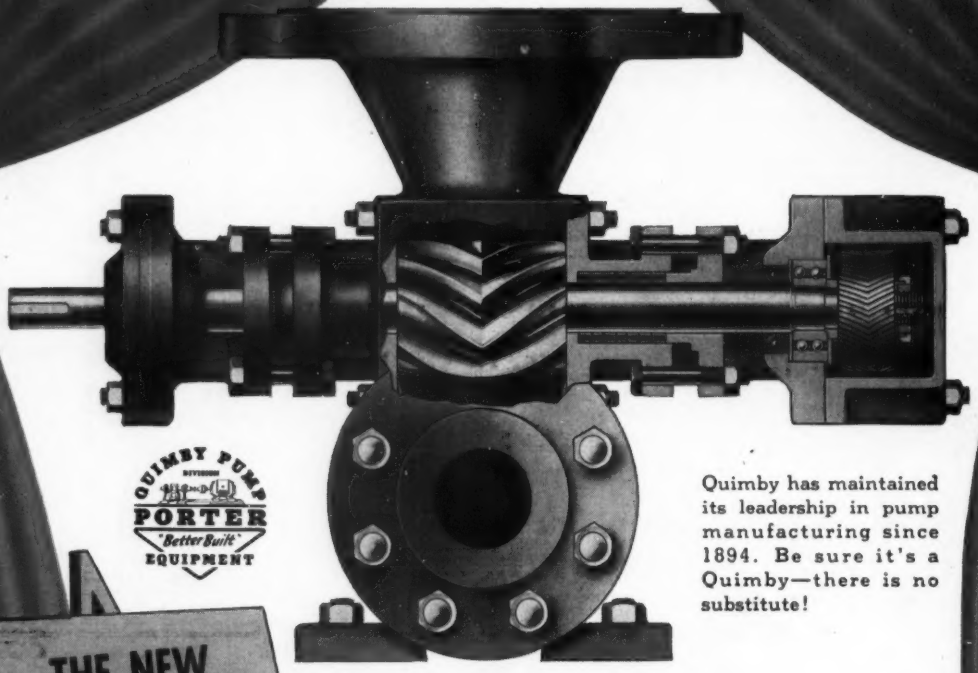

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THE OIL AND GAS JOURNAL

Frank Explanation Needed

A RECORD snowfall in New York City and environs, the world's largest oil-consuming area, and low temperatures in several other sections have brought charges that a "black" or "gray" market exists in the sale of furnace oils and residual fuels. Cases are cited in which it is claimed consumers were charged substantially more than the going market in order to secure prompt delivery of needed supplies.

The daily press and radio have reported developments without taking time to check them as to accuracy and background, and with no recognition to thousands of distributors who have kept their customers supplied under most difficult operating conditions with prices unchanged.

There is no mystery in regard to the oil industry's pricing practices. They start with the posted schedules for crude oil based on specifications and transportation costs to market outlets. Refiners add their processing charges to the delivered cost of the crude oil, and prices are established for the finished products. The delivered price to consuming centers is the refinery price plus transportation. Distribution charges vary with the product and type of delivery. Generally there is an orderly pricing procedure from the wells to consumers, subject to keen competition at several points.

Furthermore, the great bulk of the petroleum in this country is produced, refined, transported, and distributed under long-term agreements which assure protection for both buyer and seller. Stable markets and adequate supplies could not be maintained under any other pricing policy.

Because of restrictions in operations during the war period and because of large increases in consumption over the past 2 years, demands for some products in certain areas have exceeded the supplies. This condition, coupled with much higher operating costs, explains the general price advances of the past 18 months which have been equitably distributed within the oil industry's operations.

The objective of those who have the major responsibility in supplying the present record requirements is to maintain orderly markets at all times. They are now seeking the assistance of customers in ending wasteful practices in the use of oil as fuel. Allocations of available supplies are on an equitable basis.

But these large and small suppliers have no control over the practices of a few jobbers and dealers who charge whatever they think the traffic will bear and who, it is now alleged, have taken advantage of emergency conditions. The danger to the oil industry is that it will be judged by consumers and Washington investigators by the exception rather than the rule. A frank explanation of conditions is a primary need of sound public relations at this time.

45 Per Cent More Steel Needed to Maintain Reserves, I.P.A.A. Says

by Henry D. Ralph

THE supply of drill pipe, casing, and tubing available to the domestic oil industry this year must be 25 per cent greater than the 1,000,000 tons obtained in 1946 if crude production is to meet the anticipated demand, according to a study of the steel requirements of the oil industry just completed by the Independent Petroleum Association of America.

The supply must be 45 per cent greater this year if new proved reserves are to be brought up to the prewar ratio to production.

During the next 4 years the supply of drilling steel must increase progressively so that by 1951 it will be 32.5 per cent greater than 1946 just to keep oil production up to current demand, and 53 per cent greater if proved reserves are to be brought back to a safe and traditional level.

These conclusions are based on a novel and interesting analysis of the amount of steel which has been used by the drilling and producing branch of the industry, and the results obtained in footage drilled, oil produced, and reserves added. It covers only oil-country goods, identified as steel casing, tubing, and drill pipe, and not line pipe nor other steel products used by the oil industry.

Best Approach to Date

Termed by I. P. A. A. the most comprehensive and careful approach to the problem of required supply that has been made to date, the study uncovered certain basic relationships among petroleum production, reserves, drilling activity, and steel supplies. It was prepared to help the oil industry obtain sufficient supplies, assist the steel industry in allocating products and mill capacities, and guide the Government in export control and foreign-aid programs.

High points of the study include these findings:

1. There is a direct mathematical relationship between drilling activity and proved reserves added, year by year (see accompanying chart.)

2. During the 15 years prior to the war the oil industry added 1.68 bbl. of reserves for each barrel of crude produced.

3. During the war years of 1942 to 1945 steel supplies were so restricted that the industry drilled 74,000,000 ft., or 20 per cent, less than required to maintain reserves at this 1.68 ratio.

4. It requires 11 tons of oil-country tubular goods to drill 1,000 ft.

5. The 1,000,000 tons of steel used in domestic drilling in 1946 increased reserves by the historic ratio.

6. To meet the anticipated demand for domestic crude and to maintain the ratio of new reserves to production the industry will have to drill 113,100,000 ft. of hole during 1948, which will require 1,245,000 tons of tubular goods.

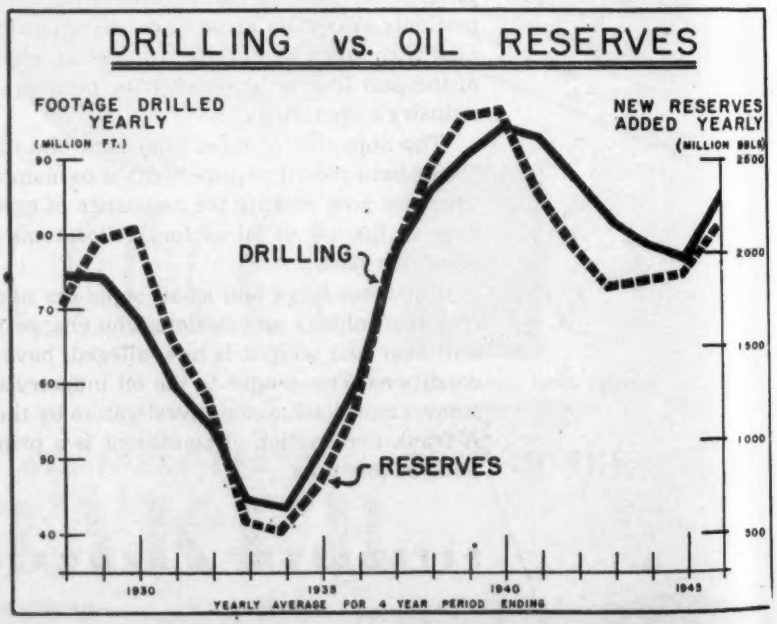
7. To make up during the next 4 years for the loss of reserves during the 4 war years, the drilling industry will have to have 1,450,000 tons of tubular goods in 1948, 1,475,000 tons in 1949, 1,505,000 tons in 1950, and 1,530,000 tons in 1951.

8. The drilling industry's steel requirements are about 40 per cent above the prewar average whereas oil demands are more than 70 per cent higher. Total steel production is 80 per cent above prewar whereas 1946 production of oil-country tubular goods was only 2 per cent greater. A proportionate increase would provide ample drilling supplies for both domestic and export programs.

By applying these findings the I.P.A.A. developed what it calls the minimum drilling program required during the next 4 years, as shown in the following table:

	Prelim.	Projected			
	1947	1948	1949	1950	1951
U.S. domestic petroleum demand:					
Million bbl. per year	1,975	2,120	2,180	2,240	2,300
Per cent increase over 1947	....	7.3	10.4	13.4	16.5
U. S. crude production:					
Million bbl. per year	1,850	1,985	2,042	2,098	2,155
Addition to U. S. petroleum reserves:					
Million bbl. per year	....	3,335	3,430	3,525	3,620
Total footage drilled:					
Million feet per year	....	113.1	115.5	118.0	120.4
Supply of oil-country goods:					
Thousand tons per year	....	1,245	1,270	1,300	1,325

Above this minimum program the I.P.A.A. has projected what it terms a normal program, or a rate of drilling necessary to increase reserves, during the next 4 years, by the amount they fell behind during the 4 war years. This calls for drilling an additional 18,500,000 ft. each year,



which would require 205,000 tons of steel per year above the quantities shown in the table.

Noting that actual crude production during the war years averaged 1,570,000,000 bbl. per year, the report says that additions to reserves should have averaged at least 1.68 times this, or 2,640,000,000 bbl. per year, which would have required 95,300,000 ft. of drilling per year. The actual drilling during the war years averaged 76,800,000 ft. per year, and, according to the formula, this should have increased reserves by 1,920,000,000 bbl. per year. Actually, the additions to reserves during the war averaged 1,886,000,000 bbl. per year which, the I.P.A.A. says, is within 2 per cent of what would be expected by application of the formula and demonstrates the value of this method of forecasting the future.

From this war history the report concludes that the reserve deficiency of 754,000,000 bbl. per year was caused primarily by a drilling deficiency of 18,500,000 ft. per year. The amount of drilling done during the 4 war years should have required a total of 3,379,200 tons of casing, tubing, and drill pipe, but only 3,040,000 tons were made available to the oil industry, with the result that mill, field, and customer stocks were substantially depleted.

Application of Formula

Applying this same type of analysis to the present, the I.P.A.A. said that in 1946 crude production was 1,733,000,000 bbl., which means that, according to the 1.68 formula, reserves should have been increased 2,910,000,000 bbl., which could have been attained by drilling 102,200,000 ft. Actual drilling in 1946 was 101,000,000 ft. which increased reserves by 2,863,000,000 bbl. or precisely what the formula anticipated.

During 1947 crude production was 1,850,000,000 bbl., which requires that reserves be increased by 3,110,000,000 bbl., or 107,300,000 ft. of drilling. The report assumed that 108,000,000 ft. of drilling was done in 1947 which, under the formula, should have increased reserves by 3,140,000,000 bbl., but actual reserve figures are not yet available.

From this it is concluded that the current drilling program is just sufficient to keep reserves ahead of production by the prewar ratio, but not large enough to make up for the reserves lost during the war.

On the basis of 11 tons of steel per 1,000 ft. of drilling, the oil industry should have had 2,299,000 tons of oil-country goods during these past 2 years. It obtained only 1,000,000 tons in 1946, and 1947 figures are net yet available, the I.P.A.A. says, but the lack of new supplies is evident in the growing practice of abandoning old wells prematurely in order to obtain second-hand pipe.

Congress Probes Oil Exports and Prices; Industry Asked to Act

by Bertram F. Linz

WASHINGTON.—The Canadian Government has agreed to cut imports of petroleum products from the United States this month to 50 per cent of what they were in January 1947, and to make proposals for further reduction of the drain on our oil resources through February and March.

Announcement of the agreement by Assistant Commerce Secretary David E. K. Bruce, who told the Senate small business oil subcommittee January 5 that if it is not scrupulously adherred to export controls will be imposed, was one of a number of developments as Congress prepared to meet.

Chairman Walter S. Hallanan called the National Petroleum Council to meet January 22, and disclosed that Chairman George A. Hill, Jr., of the agenda committee had recommended the appointment of a committee, as requested by Director Max W. Ball, of the Oil and Gas Division, to submit recommendations as to the industry's voluntary agreement under the Taft resolution. That matter will be one of several important subjects to be discussed at the meeting.

Sen. Olin D. Johnston of South Carolina announced he would ask a Congressional investigation of the oil industry to determine whether "the big oil companies are holding oil off the market so the people will be scared and they can run prices up."

Asks Check on Storage

Johnston also announced he had requested the Justice Department to check on storage and distribution of fuel oil, but Department officials scouted suggestions that the present shortage is the result of a price-fixing monopoly, Peyton Ford, assistant to the Attorney General, informing Rep. Thomas J. Lane of Massachusetts that the department has uncovered no evidence of such a monopoly in New England.

Sen. Ralph E. Flanders of Vermont, in a letter to President William R. Boyd, Jr., of the American Petroleum Institute, urged that the desirability of arresting further price increases in fuel oil be brought to the attention of his members and "if at all possible, making an appreciable decrease in the price at an early date." A price cut, Flanders said, would make a "major contribution" toward checking the rise in the cost of living and an "otherwise uncontrolled inflation."

Going into the question of oil exports, Sen. Kenneth S. Wherry of Nebraska, chairman of the small business committee, charged that oil sent to Greece from the United States "deprived American small business men of supplies for the advantage of Greek small business."

Currently, Col. G. H. Vogel, executive officer of the Army-Navy Petroleum Board, testified, 7,000 bbl. a day are being supplied to Greece to make up a deficiency which cannot be obtained elsewhere by the American mission, but only 40 per cent of it comes from domestic sources. The amount furnished is about one-third of total Greek requirements, the remainder of which is secured in the Middle East.

Military Requirements

Vogel reported that military requirements for the current fiscal year, which last August were estimated at 112,500,000 bbl., have been increased to 116,000,000 bbl., but explained this is due in part to the inclusion of supplies for Greece and the necessity, since last October, of supplying the British-United States zones in Germany with dollar instead of sterling oil.

Total military requirements are 342,600 bbl. daily, of which 243,600 bbl. is being obtained from the United States and 99,000 bbl. offshore.

Vogel told Wherry that the board is operating on working stocks of 150 to 165 days, which he said represents the minimum safe margin. Rather than release any of its oil to assist the domestic supply, he said, the board prefers to release companies from their offers whenever military stocks are adequate, which permits the oil to get into commercial channels almost immediately. The board now is resurveying its stocks with a view to taking such action.

Wherry's questioning brought out that the military buys the oil for Greece, delivering it to the Greek Government at the market price, and turns over any profit that might result to the United States Treasury. Vogel admitted that when bids are asked no information is given that the oil is not for military needs, and Wherry demanded that the State Department, at whose request the military is doing the buying, review the situation with a view to buying openly.

None of the oil to be furnished

France and Italy under the interim aid program will be bought through ANPB, Wherry was assured by C. Tyler Wood, deputy to the Assistant Secretary of State for Economic Affairs. Further, Wood said the program provides for less oil than those two countries procured in the corresponding period last year.

Department figures showed that France will get 1,400,000 bbl. of crude and products from the United States and 3,500,000 bbl. from other sources, and Italy will get 342,000 bbl. from this country and 1,370,000 bbl. elsewhere.

Getting into the Canadian situation, Wood said Canada is reluctant to have any controls imposed, by itself or this country, if the same results can be achieved by voluntary means, and indicated the State Department also leans to cooperation.

Assistant Secretary of Commerce Bruce also expressed satisfaction with the arrangement which will cut Canadian takings of United States oil products this month, but disclosed arrangements had been made for the collection of weekly statistics on exports across the border, so the department should learn quickly whether Canada actually reduces her imports.

Bruce held there was nothing in the Hyde Park agreement which precluded the imposition of export controls, and said they would be adopted if the voluntary arrangement does not work out. Wood agreed that limitations could be imposed, but did not disclose his department's attitude toward Bruce's insistence on a reduction of exports.

The agreement applies only to certain products and not to crude, of which Canada imported 28,561,000 bbl. from the United States in the first 9 months last year compared with 27,153,000 bbl. in the same period in 1946. The increase in crude acquisitions, it was suggested, might be the result of additional storage facilities which have been completed in Canada. Commerce Department officials expressed confidence that none of the supplies furnished Canada are being reexported by that country.

Currently, Wherry was told, efforts are being made to work out a similar agreement for steel, but the matter has not progressed to a point where open discussion is possible.

Allocations of first-quarter exports, expected to be announced within a few days, will carry a quota of 45,000 bbl. of aviation gasoline for Greece, it was disclosed by Acting Secretary of Commerce William C. Foster in a letter to Sen. Charles W. Tobey of New Hampshire, chairman of an interstate commerce subcommittee which also is investigating the shortage.

Foster also said an additional quota of 2,425,000 bbl. of oil, has been established for Japan and the Ryukus Islands, formerly supplied by the military.

Without further comment, Foster pointed out that during the past 4 weeks Gulf stocks of distillate fuel oil have been decreasing at a rate about 500,000 bbl. a week more than the rate of decrease in the same period a year ago, and stocks of residual fuel oil have been decreasing at a rate of 200,000 bbl. a week more than the same period in 1946.

An announcement made last week that $300,000 worth of aviation gasoline had been allotted to Italy under the interim-aid program, was corrected by State Department officials, who explained the Italian Government had made a request for such an allocation but it had been disallowed as inappropriate for the relief program.

Pan American Refinery Closed by Strike

HOUSTON.—Pan American Refining Corp.'s 100,000-bbl. daily plant at Texas City, a major unit in the Gulf Coast refining industry, has been shut down as a result of a strike by the Oil Workers International Union.

Approximately 1,400 workers were idle in the shutdown which commenced at 12:01 a.m., January 1. A skeleton crew was remaining on duty as a safety measure, and a union official said pickets would not be posted since the company had agreed not to bring in workers.

The union had asked that the 22-cent-an-hour cost-of-living payment and a 28-cent-an-hour increase be made a 50-cent-an-hour raise. The company offered to add 30 cents an hour to all base pay rates and to make various individual classification adjustments, a company official said.

On January 4 about 240 members of the O.W.I.U. went on strike against Pan American Pipe Line Co. The union's contract expired December 31 and negotiations failed to produce a new agreement.

The Pan American plant is rated as a complete refinery with about 60,000 bbl. daily cracking capacity. Last July the company completed arrangements for the purchase of the 7,500-bbl. daily refinery of the Stone Oil Co. which it had operated adjacent to its plant for the previous 4 years on a lease basis.

A prolonged strike at Pan American's Texas City plant would be reflected in the already short supply of products in East Coast areas. Pan American is a subsidiary of Pan American Petroleum & Transport Co. and most of its products go to the East for marketing through Lord Baltimore Filling Stations and American Oil Co., also Pan American subsidiaries. Pan American Petroleum & Transport is an affiliate of Standard Oil Co. (Indiana).

There were no indications of further discussions pointing to an early end of the refinery strike.

Users Buy Control of National Transit Lines

OIL CITY, Pa.—Control of National Transit Co., a pipe line of vital importance to the Pennsylvania Grade crude oil region, returned to oil region interests January 6 with the purchase by a group of refiners and producers of stock held by two New York concerns, Wertheim & Co. and Graham-Newman Corp. The price was not disclosed. Included in the purchasing group are: Pennzoil Co., Quaker State Oil Refining Corp., and Wolf's Head Oil Refining Co., of Oil City; Kendall Refining and South Penn Oil Co., of Bradford; United Refining Co. of Warren; Waverly Oil Works of Pittsburgh; Pennsylvania Refining Co. of Butler; Cities Service Co. and L. Sonneborn Sons, of New York City.

The purchasers also have acquired additional shares of National Transit from individuals and firms associated with Wertheim & Co. and Graham-Newman Corp.

The number of shares involved in the transaction is approximately one-third of the 504,499 shares of National Transit outstanding.

All the purchasers use the lines of National Transit in connection with their business, either to transport crude to their various refineries or to gather crude oil produced.

The stock was bought by the purchasing firms individually and not jointly. It is understood that other producers, both individuals and corporations, whose production is in areas served by the National Transit gathering system, have been recently acquiring stock in the pipe line.

The purchasers state that the stock was acquired as a protection to their refining and producing interests and that it will be their endeavor to aid the management of National Transit in every way possible and to promote the efficiency of the company.

They have, furthermore, expressed the belief that ownership of National Transit by concerns which are well acquainted with its operations and which is largely owned in the area in which it does business should prove beneficial.

All of the purchasers are refiners with exception of the South Penn, which is a producer but which owns a large amount of the stock of Pennzoil, local refiner.

this week

REFINING—Strike closes 100,000-bbl. daily refinery of Pan American Refining Corp. in Texas City, major unit in Gulf refining industry. . . . Prolonged walkout would be reflected in current products shortages along East Coast. . . . ¶Stanolind Oil & Gas Co. announces plans for $80,000,000 synthol plant in western Kansas. . . . Plant to be completed within 2 years. . . . Daily production of 7,000 to 8,000 bbl. of liquid fuels and 100,000,000 lb. of chemicals a year expected. . . .

GOVERNMENT—Congress reconvenes with several oil investigations. . . . Charges of price-gouging, monopoly practices, made. . . . Voluntary price cut suggested. . . . Military buying and foreign allocations criticized. . . . ¶Export quotas set. . . . Canada will curtail imports to escape control threat. . . . ¶Departments start industry allocation procedures. . . . NPC meeting called. . . . Oil allocation program will be considered. . . .

STEEL—Producers must have 25 per cent more steel to meet 1948 demands, I.P.A.A. survey shows. . . . Need 45 per cent more to restore reserves to prewar level. . . . Says new drilling this year must be minimum of 113,100,000 ft.

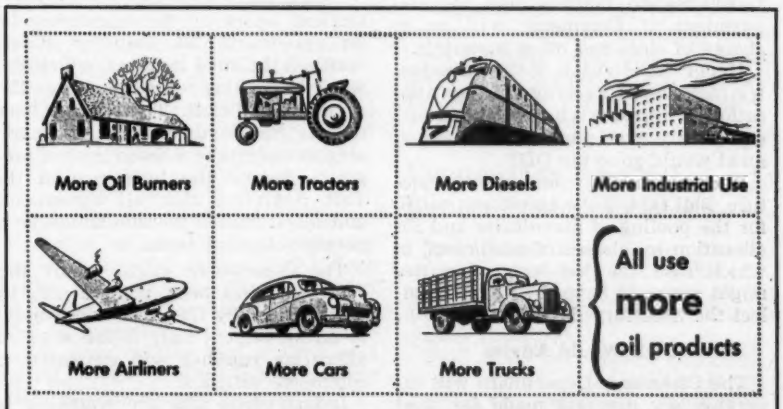
PIPE LINE—Plans under consideration by Arizona Pipe Line Co. for 620 mile, 8-in. crude-oil pipe line from Permian basin to Phoenix, Ariz., where a 10,000-bbl. refinery may be built. . . . Line would have initial throughput of 14,000 bbl. daily. . . . ¶Tentative survey completed by Northwest Natural Gas Co. for proposed $80,000,000 natural-gas pipe line from Alberta, Canada, to Vancouver, Spokane, Portland, and Seattle. . . .

INTERNATIONAL—Overproduction plus lack of equipment continues to reduce crude-oil production in Hungary. . . . One official states if production plans are carried out the fields will be ruined in 18 months. . . . ¶Pemex official says Mexico must and will increase its production of crude oil in 1948. . . . Plans are to export not less than 15,000,000 bbl. of crude oil and products in 1948. . . . Most of this to the United States. . . . ¶Gulf Oil Corp.'s subsidiary abandons initial wildcat test in Denmark at 7,985 ft. . . . Is preparing for a second test. . . .

TRENDS—Crude-oil production for week ended January 3 averages 5,302,360 bbl. daily, a decline of 8,460 bbl. daily from previous week. . . . Well completions during week ended January 3 total 630, a drop of 27 from previous week but well above the 480 completions during the week ended January 4, 1947. . . . Wildcats total 76, compared to 77 the previous week. . . . Runs to stills during week ended December 27 show a gain of 297,000 bbl. daily from previous week with a daily average of 5,543,000 bbl.

NATURAL GAS—El Paso Natural Gas Co. plans to build additional natural-gas pipe-line facilities at a cost of $3,323,000 are approved by Federal Power Commission. . . . Facilities include 83 miles of pipe line ranging from 4 1/2 to 16 in. and additions to existing dehydration and purification plants. . . . ¶Five-company natural-gasoline plant is begun near Maysville, Okla. . . . ¶Ohio Fuel Gas Co. gets approval on plans to enlarge its underground storage facilities in Perrysville field, Ohio, at a cost of $2,310,000. . . . ¶Imperial Oil, Ltd., now embarked on largest construction and development program in its history. . . . Allotted $24,000,000 for expansion. . . .

With oil-fuel consumers reported running short of supplies in winter-bound regions of the Northeast, Standard Oil Co. (Ind.) is using newspaper display advertising to tell the facts of the oil situation and instruct consumers in conservation practices. This advertisement appeared the week of January 4 in 191 newspapers with circulation of more than 12,000,000 in 14 Middle Western states



The sober facts about fuel oil supplies

With many more users of fuel oil, each one will have to customer less of it this winter, or there will be widespread discomfort and suffering from cold. In spite of record production, there just isn't enough oil to go around at all times and at all places. Some localities already have felt the pinch. The demand for fuel oil is greater than the supply—both are way up!

All unnecessary consumption must be eliminated. If everyone will save a little, there will be enough for all.

Use these two easy methods of saving. 1) Keep your home in the healthful range of 68-70 degrees during the day—never over 70°. (During the war emergency, thousands of families managed to get along in day-time home temperatures of 65°). 2) At night, lower the temperature to 65° for 8 hours. These simple steps will bring savings of almost 10%—both in fuel and in your fuel oil bill.

Supply at all-time high, demand even higher!

More oil products are being produced and delivered today than at any previous time—even more than were needed for the vast demands of the war. Military needs are still high. Demand has outstripped supply. Demand is 33% greater than in the biggest pre-war year. Much more fuel is used for heating homes (1,200,000 new oil heating units were installed in 1947), more fuel is used on the farms, more by industry, more by Diesel locomotives and airliners, more by America's motor cars and trucks.

Tremendous expansion program in full swing

America's oil companies—including Standard Oil—are setting new records in production and refining. They are working twenty-four hours a day, 7 days a week. They are investing four billion dollars in new equipment in 1947-1948. But scarcity of some materials is delaying construction of needed new facilities for production, refining, and transportation.

How much oil will you get?

Temporarily, we won't be able to deliver "all you want" to all who want it. Our first obligation is, of necessity, to our customers. This Company will meet that obligation to the best of its ability under the circumstances.

If, in turn, our customers will cooperate with us by making voluntary savings . . . best of all, if they will save at least 10%, as previously suggested, we will be able in allocate to the relief of hardship cases the oil thus saved. Our customers will make substantial dollar savings, and they will greatly help their friends and neighbors. Voluntary cooperation can and should be the answer to this emergency.

The cards are all on the table. The situation is clear. If you burn fuel oil, there's no escaping your need to save as much of it as you can—*starting right now.* Such saving is the strongest assurance you can have of getting enough fuel oil to meet the demands of health through the winter.

A word to Standard's fuel oil customers

Recently we sent you a copy of a booklet, "How to Save Money on Oil Heating." Please read it. It will show you how to save oil. We urge you to save at least 10%. In the pages of this booklet you will find steps you can take to accomplish this saving. Please put them into practice. Your need to do so is urgent.

EASY WAYS TO SAVE FUEL OIL

- Keep thermostat down to the healthful range of 68-70 degrees . . . never more than 70° . . . 65° at night and when you're away from home.
- Have your oil burner cleaned, adjusted, and the controls checked, if this has not been done.
- Maintain proper humidity.
- Don't leave outside doors standing open longer than necessary.
- Keep fireplace damper closed.
- Close off unused or seldom used rooms.
- If you open your bedroom windows at night, keep bedroom doors closed.
- Pull window shades at night.
- Caulk frames and sills of windows.
- See to it that storm windows fit snugly. Properly fitted storm windows will save up to 20% on fuel.

If everyone saves a little, there will be enough for all

STANDARD OIL COMPANY (INDIANA)

STANDARD SERVICE

OGD Only to Coordinate Plans Under Taft Bill, Ball Says

WASHINGTON.—Role of the Oil and Gas Division in the operation of the voluntary agreement which the oil industry may make under the Taft resolution will be limited to the minimum of activity desired by the industry or requested by the Department of Commerce, under present plans of Director Max W. Ball.

Those plans, Ball said, do not contemplate that the OGD shall act as a "claimant agency" to get steel for the oil industry or attempt in any way to inject itself into the operation of the oil-industry agreement.

Estimates have been made, however, of the amounts of money which would be required by the division to carry out responsibilities which may be entrusted to it by the industry committee which will administer the agreement, but the figures are purely tentative.

Under a delegation of power by the President, the Interior Department will handle all oil matters arising under the resolution, the Office of Defense Transportation will handle all transportation matters, and the Department of Commerce will be in charge of steel and other materials.

Under this division, if the oil industry includes in its program any allocation of transportation facilities and equipment, that phase of the agreement would go to the ODT.

The OGD might come into the picture, Ball said, if the agreement called for the pooling of inventories and for allocation by classes of customers, in which case the industry committee might desire to have the division collect the necessary data.

OGD Would Advise

The Commerce Department will supervise any program made for steel allocation and will have the final say as to what the oil industry may get, but undoubtedly would call upon the OGD to advise regarding industry needs, and possibly as to what needs are most acute and should get preference over other operations.

The cost of these activities, Ball said, might run as high as $500,000, but he hopes it would be much less and, in any case, he commented, any figures projected now, in advance of definite information as to what the industry plans to do, are merely a "shot in the dark."

No great expansion of the OGD is possible, Ball said, without assignment of men by the industry. A deficiency appropriation of $25,000 is being asked to enable the addition of two or three men to the staff, now heavily overloaded, but he turned down suggestions that a larger staff be recruited because of the difficulty of finding men of the proper caliber willing to take government jobs.

Ball explained that the half-million which may be necessary for the industry agreements will be in addition to the sum which is being sought to permit the Bureau of Mines to compile mineral-industry statistics. Something in the neighborhood of $750,000 or more will be sought for that work, but only $150,000 of it will be earmarked for oil.

"My idea of what the Oil and Gas Division should be and do is the same as it always was," Ball said, in dismissing reports of a contemplated great expansion. "The agreement should be developed and handled by the industry itself, with the division serving only in a coordinating capacity and on matters in which its help is sought by the industry."

Machinery Being Set Up

Meanwhile, as the oil industry worked to set up the machinery for an agreement, all industry closely watched the steel industry, which this week is meeting with Commerce Department officials. There have been reports that the department was planning to undertake a broad control program, despite the insistence in the Taft resolution that all agreements and all activities thereunder be on a purely voluntary basis.

The department might secure this control, it has been pointed out, by telling industry that it would consent to an agreement only if the work of allocating supplies was entrusted to commerce officials.

Industrialists also are watching to see if the politics which was so pronounced in the President's request for control authority and the answer of Congress in the form of the resolution will extend to the development and administration of the agreements themselves. To this end they will carefully analyze any agreement made by the steel industry, which probably will be the first to work out a program, and also will watch the Department of Justice to see whether it turns down any agreement that gives promise by its success of supporting Republican contentions that the whole supply situation can be met by voluntary industry action without the control authorities the President is still demanding.

In an executive order January 3, President Truman assigned to the Interior Department the responsibility for agreements on petroleum and petroleum products, natural and manufactured gas, and coal and coke.

The order authorizes the department to establish such committees and other working groups as may be appropriate to consult with and obtain the advise of other agencies, and instructed the Secretaries of Commerce, Interior, and Agriculture and the Director of Defense Transportation to collaborate closely with the Attorney General.

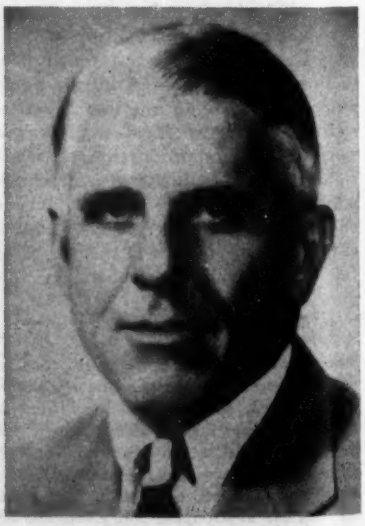
D. L. Connelly Chosen Warren Oil President

DON L. CONNELLY, formerly manager of crude-oil operations for Warren Oil Corp., last week was elected president of the company. He succeeds J. H. Boyle, who resigned effective January 1 to become associated with Hanlon-Boyle, Inc., a new company formed by E. I. Hanlon and Boyle.

Connelly began his career in the oil business in 1922 when he joined Gypsy Oil Co. as a scout and landman. In 1926 he became an independent operator at Cisco, Tex. After 2 years he joined Indian Territory Illuminating Oil Co., later becoming manager of the land and geological division of the company at Bartlesville, Okla.

When I.T.I.O. was merged with Cities Service Oil Co. in 1941, Connelly was sent to Houston as manager of the Texas land and geological division. He resigned in 1944 to join the Warren organization as manager of its oil operations in Texas and the Gulf Coast area.

As head of Warren Oil Corp., which is a wholly owned oil-producing subsidiary of Warren Petroleum Corp., Tulsa. Connelly will continue to make his headquarters in Houston.



D. L. CONNELLY

Oil-Export Quotas Are Set Lower for First Quarter

WASHINGTON. — A first-quarter export quota of 12,000,000 bbl. of petroleum products was announced by the Office of International Trade January 2, but with no indication of the allocations to individual countries.

OIT officials explained that the country allocations had been held up by last-minute changes, but probably will be announced this week.

The quota for the current quarter is the same as that originally announced for the fourth quarter of last year, but is more than 5,000,000 bbl. under actual shipments in the first quarter of 1947. The fourth-quarter quota, however, was increased toward the end of the year by 200,000 bbl. of aviation gasoline, required by Newfoundland before the winter freeze set in.

To the extent that a quota has been set up for blending agents for the first time, in the amount of 150,000 bbl., exports of other controlled products will be reduced. Specifically, the new order provides for 700,000 bbl. of aviation gasoline, against 600,000 last quarter; 5,250,000 bbl. of motor gasoline, against 5,400,000; 900,000 bbl. of kerosine, against 1,000,000; 3,200,000 bbl. of gas oil and distillate fuel, against 3,000,000, and 1,800,000 bbl. of residual fuel oil, against 2,000,000.

Officials said that the making of country allocations will be largely a juggling about of the amounts granted for the last quarter, since the reduction is only 1¼ per cent. With additional information now available, it is planned to give specific figures for a number of smaller countries which were bulked together in the allocation table issued 2 months ago.

Conference with Majors

Before the country figures are announced, officials of the major companies will be called into conference, in line with the OIT's policy of keeping in touch with the industry in the interest of a mutual understanding of the problems of both.

The export allocations do not include oil moving to Canada. Under the so-called Hyde Park agreement made by President Roosevelt during the war for the pooling of the resources of the United States and Canada, no limitations can be imposed by this country on oil going across the border.

Officials said, however, some question has been raised as to the amount of oil moving to Canada and while no regulatory steps can be taken, the exports from here on will be much less by mutual agreement.

The OIT also announced last week a new export licensing policy which will not be extended to oil this quarter but probably will apply March 1. The new policy abandons the so-called historical method of selecting exporters, which has been difficult to explain to Congress and is felt leads to monopoly by closing the doors of export trade to small independents who may wish to get into that field.

A "more competitive selection" of exporters will be sought, under which OIT will approve those shipments which make the least demand upon the limited supply of dollar exchange of the importing government and, second, which are accompanied by evidence of the lowest-price contracts for comparable material under comparable conditions of supply.

"Licensed exportations from the United States have recently come into severe criticism because of the very wide disparity sometimes existing between prevailing domestic prices and those charged foreign purchasers," OIT explained. "Discussions with members of the United States trade community, the Congress, and foreign governments have emphasized the necessity of checking this added drain on limited dollar exchange."

Price Factor in Picture

Officials said it would take about 3 months to develop the machinery for handling oil-export applications under this system. They indicated they did not believe the price factor was as pronounced in oil as in some other commodities, but that it was being brought into the system so that all commodities may be covered.

Reorganization of OIT is under way, with the functions of the export supply branch to be transferred to the various commodity divisions, which then will set up industry advisory committees to assist them in obtaining the information necessary for major decisions. Heretofore, there has been but one advisory committee, organized on an over-all basis and composed chiefly of exporters, although, as in the case of oil, officials in charge of various commodities have called industry representatives in from time to time.

The next big decision of OIT in the export field is expected to cover the shipment of line pipe to Saudi Arabia. In view of the situation there, with pipe-line workers called in because of the unrest over the division of Palestine, it appears likely that no further large amount of pipe beyond that shipped last quarter will be required for several months. Director Max W. Ball of the Oil and Gas Division, accordingly has recommended that a first-quarter allocation of pipe be held up, in which he is joined by the Army-Navy Petroleum Board.

Ball further recommended that if no pipe is earmarked for "Tapline" it should not be put in the general export pot, but should be retained in this country for distribution to the domestic industry. He took the position that pipe should be allocated only as the constructors could use it and no big stockpile should be permitted to accumulate abroad so long as domestic operators are suffering for lack of supplies.

Garbade New President Of Deep Rock Corp.

William H. Garbade, an executive of Shell Oil Co., Inc., New York, has been elected president of Deep Rock Oil Corp., with headquarters in Tulsa.

Garbade succeeds C. K. Baxter, who assumed the duties of president on an interim basis following the death of Henry N. Greis in July 1947. Baxter will continue as chairman of the board. Garbade succeeds Jason L. Honigman as a director of the corporation.

Garbade has had 15 years of experience in several branches of the Shell company's operations, including marketing, transportation, finance, economics, and organization work.

Cooperative Buys 44 Illinois Producing Wells

The Indiana Farm Bureau Cooperative Association has purchased producing properties of National Associated Petroleum Co., Tulsa, for a reported $1,000,000.

The properties, located principally in southern Illinois, include 44 producing oil wells and undeveloped leases.

Manziel Sells Interests In Merigale-Paul Field

HOUSTON.—Bobby Manziel, independent oil operator of Tyler, Tex., has announced the sale of all his properties in Merigale-Paul field, Wood County, to Blue Bird Investment Co., Dallas.

The properties will be operated by Talco Pipe Line Co., which, with American Liberty Oil Co., is controlled by Blue Bird Investment. Thurman Shamburger will continue as superintendent, Manziel said. Consideration in the deal was reported at about $2,000,000.

International

WORLD-WIDE OIL DEVELOPMENTS

Russian Overproduction Cuts Hungarian Output

CRUDE-OIL production in Hungary continues on the downgrade, a situation which is largely due to overproducing that country's fields by the Russian administrative staff. The situation is also aggravated by the fact that Hungary needs additional equipment which to date has been impossible to obtain.

The crude-oil output, as of last September, dropped to 43,140 tons, or approximately 10,785 bbl. daily. This compares with a monthly production earlier in 1947 of 54,560 tons, 13,635 bbl. daily, for January, and 48,440 tons, 12,105 bbl. daily, for June. In 1945, the average monthly production was 54,650 tons, or 13,658 bbl. daily.

Refining of gasoline dropped to 10,540 tons, 2,385 bbl. daily, for September 1947, compared with 19,305 tons, 4,723 bbl. daily, for August 1946. Gas oil and light fuel oils fell to half the average output for the preceding years.

Commenting on these figures, which were released in Budapest late in December, Reuters states that Hungary's obligations to deliver large quantities of oil to Czechoslovakia and Poland, under commercial treaties with these two countries, no longer can be fulfilled without effecting a drastic cut in domestic consumption. Domestic consumption has already been cut once, in September, from the 1946 monthly average of 52,890 tons, 13,293 bbl. daily, to 43,140 tons, 10,775 bbl. daily.

Decree Would Ruin Fields

Last August, Paul Ruedemann, United States director of Magyar Amerikai Olajipari Reszvenytarsaag (MAORT), wholly owned subsidiary of Standard Oil Co. (N. J.), stated that if the Russian decree, whereby a high minimum production figure was set for the production of MAORT's fields, were carried out, the fields would be ruined within 18 months, or by February 1949. MAORT's oil fields were seized by the Russians in the spring of 1945, and, despite U. S. State Department protests, are still under their control.

In carrying out the first phase of Hungary's so-called "Three Year Plan" to increase that nation's crude-oil output, the joint Hungarian-Russian Oil Co. (Maszovol) reportedly has found favorable locations in the Biharnagybajom area, near the Tisza River. However, indications are that actual drilling may not get under way for quite some time—presumably because of the lack of equipment.

Pemex Seeking Way to Attract New Capital

NEW YORK.—Mexico must and will increase its production of crude oil in 1948, Antonio J. Bermudez, Director General of Petroleos Mexicanos, told The Oil and Gas Journal in an interview January 5.

Concerning the reentry of foreign oil capital into Mexico, Bermudez said that "the policy of the government is not subject to change." He explained that "we are trying to find a way to invite foreign capital in such a way that it would be acceptable to foreign oil companies and mutually beneficial to the companies and Mexico."

In regard to the oil potentialities of his country, Bermudez said that "there is no country in the world today with more possibilities than Mexico. Here there is a brilliant future and furthermore there is no better risk for outside capital. It is as good a risk as there is anywhere in the world. I believe that the largest oil reserves in the world are in my country. It is God's gift that they have remained undeveloped, which has been sort of a savings account which we can cash in at present by going after increased production within the scope of our resources. We intend to do our share now that the world needs oil as it does."

In commenting on Mexico's past activities, Bermudez pointed out that Mexico increased its 1947 production to 155,000 bbl. daily, an increase of 23,700 bbl. daily as compared with 1946.

In increasing the production in 1948, Bermudez said that this will be done largely by drilling more wells, most of which will be by Pemex operators. Some United States drilling contractors will supplement Pemex drillings.

In 1948, Pemex plans to export not less than 15,000,000 bbl. Most of this will be to the United States with some to Europe. This figure includes both crude oil and products. Financial revenue in 1947 totaled $55,000,000 in excess of what was realized in 1946, Bermudez said.

Starting January 5, a geologists' convention, which will last most of a week, commenced in Mexico City. At this convention, Pemex and United States geologists planned to discuss the potentialities of Mexican oil.

Danish Wildcat Abandoned; Additional Tests Planned

Danish American Prospecting Co., Gulf Oil Corp. subsidiary, has abandoned its initial wildcat test in Denmark at 7,985 ft. and is moving the rig to the east side of Jutland where a second test will be drilled. The initial test was abandoned in lower Mesozoic. It was located in the Province of Ringkobing in west central Jutland.

Danish American has one seismograph and one gravity-meter party working in Denmark as well as two portable rigs operating in addition to the rotary rig which is being used exclusively for oil drilling. The other two rigs are seeking either salt or oil.

Iranian Crude Output Up Again After September Low

Anglo-Iranian Oil Co., Ltd.'s Iranian crude-oil production for October was 1,687,000 tons, or 408,145 bbl. daily, compared with September's output of 1,577,000 tons, or 387,583 bbl. daily. The highest monthly output of A.I.O.C. during the first 10 months of 1947 was 2,056,000 tons, or 510,683 bbl. daily, which was reached in August.

Total crude-oil production for the company, from January 1 through October 31, was 16,629,000 tons, or 403,675 bbl. daily. This compares with 15,816,000 tons, or 390,197 bbl. daily, for the same period in 1946.

Las Mercedes Pipe Line Is Outlet For Guarico Region, Venezuela

by Paul Reed

WITH the construction of the Las Mercedes 157-mile 16-in. pipe line to be started at the end of this year, the Guarico region of Venezuela will obtain its first outlet for shipping crude oil to the coast.

The pipe line will be built from Guasimito pump station, approximately 5 miles from Las Mercedes field, to the Pamatacual marine terminal, just east of Guanta in the general vicinity of Puerto la Cruz.

The line is to be built by Sociedad Anonima Petrolera las Mercedes, owned 50-50 by The Texas Co. and Caracas Petroleum Co., an English firm connected with mining interests. A contract has been let to Williams Brothers Co. for construction operations of the line which started in December and is to be completed during the dry season ending in May 1948. Some work has been going on for several months in connection with tank and marine-terminal construction.

Throughout a major part of its length the pipe line will be laid within a right-of-way alongside the Guarico Road built in 1946 by a group of oil companies to facilitate Guarico operations which represent the greatest exploration effort in South America in the last 2 years. The line is to serve all fields surrounding the Las Mercedes area.

The 16-in. diameter was chosen in the hope that other producing fields will be discovered in the general area for which the line may serve as an outlet.

Guard at entrance to camp containing offices and shops of S.A. Petrolera las Mercedes in Las Mercedes field. Buildings beyond were used for offices during early stages of development

Map showing route of 16-in. pipe line from Guasimito (near Las Mercedes field) which parallels the Guarico road to the new port at Pamatacual (near Guanta)

The terrain traversed is gently rolling and readily accessible by good roads. Three rivers will be crossed, namely the Tamanaco, Unare, and Neveri.

Pipe for the line will be 16-in. o.d., ¼-in. wall, Grade B, high-manganese steel, 45,000 minimum yield point, designed for 900-psi. operating pressure. It will be furnished by Republic Steel Corp. The line is to be laid bare on wooden skids at a height of 6 in. above the surface of the ground in a manner similar to that followed at Consolidada's Santa Barbara line and Creole's Jusepin line. At river crossings, pipe with ½-in. wall will be used. This will be equipped with river clamps and double coated with asphalt enamel having Fiberglas as a reinforcing membrane.

The line will have insulated block gate valves.

Gathering lines are to consist of 10 miles of 6-in., Victaulic coupled in-

Drilling operations in Las Mercedes field

Oil well in background; lines and pump for water-supply system in Las Mercedes field

vasion pipe to operate at 200 to 500 psi.

For initial operation the line will be served by only the Guasimito pump station. This will be equipped with two centrifugal-pump units to operate in series. Each of these will consist of an 800-hp., 8-cylinder, 330-r.p.m., (15¼ by 18-in. power cylinder), V-type Ingersoll-Rand gas engine driving, through Farrell-Birmingham stepup gears, a three-stage 6-in. Ingersoll-Rand centrifugal pump operating at 3,550 r.p.m. This pumping equipment will handle a 60,000 to 65,000-bbl. daily throughput. There is an abundance of gas in Las Mercedes field for engine fuel.

Coolers for Engine-Jacket Water

Coolers for engine jacket water will be located on the suction side of the station. Lubricating oil will be filtered through Honan-Crane clay-type filters.

Crude oil will be pumped from the five tank batteries of Las Mercedes Co. at strategic points in Las Mercedes field by five transfer pump units, each having a Le Roi engine driving a Gaso pump. This crude will go to three 130,000-bbl. cone-roofed tanks at the Guasimito pump station. This tankage has been completed. From these tanks it is to be pumped to the station's high-pressure centrifugal pumps by means of a low-pressure pump on the tank line operating at approximately 35 psi. which is sufficient to avoid cavitation.

The electric power plant at the Guasimito station, made up of two 125-kw. General Electric generators driven by Ingersoll-Rand gas engines, has been designed with sufficient capacity to serve both the pump station and a projected pressure-maintenance plant, which will be constructed at the same time. One man will supervise both the pump station and the pressure-maintenance plant.

The marine terminal at Pamatacual is located on a well-protected bay with water 14 fathoms (84 ft.) deep.

On the shore, Las Mercedes Co. is erecting four 130,000-bbl. floating-roof tanks on an elevated site having ample space for additional tankage. Tanks at both Guasimito and Pamatacual are being built by Chicago Bridge & Iron Co.

Loading will be done by 18 and 16-in. sea loading lines to extend 1,900 ft., more or less, from shore to a submarine loading berth having the conventional five-spot buoy arrangement.

Buoys will be held by 3-in. chains to 8-ton anchors. With these marine terminal facilities loading will be done entirely by gravity at the rate of 13,000 to 15,000 bbl. per hour. No pumps are installed at this terminal.

A small dock is to be provided for the mooring launch. On top of the hill there will be staff houses and quarters for laborers.

Communication will be maintained by a 250-watt, high-frequency radio system operating with frequency modulation. The antenna at the terminal end will be directly on top of a mountain where it will have a height of 145 ft. in order to put it in direct line of vision with a 400-ft. antenna at Guasimito. Radio has been found to cost half as much as telephone communication and it is just as effective for communication.

Pemex Production Drops Below Estimate for 1947

Production in Mexico for 1947 will approximate 55,000,000 bbl., or 150,600 bbl. daily, according to an announcement by Petroleos Mexicanos (Pemex) in Mexico City. If the Pemex figure is correct, this will be under previous estimates which stated that Mexico's 1947 crude-oil output would total 56,575,000 bbl., or about 155,000 bbl. daily.

Crude-oil production in 1946 was 49,056,000 bbl., or 134,400 bbl. daily. Mexico's highest annual production was in 1921 when the output reached 193,398,000 bbl., or 529,857 bbl. daily, which was then around 25 per cent of the world's total output.

Russia Claims Increase In Natural-Gas Output

A 25.5 per cent gain in natural-gas production during 1947 over the previous year within the U.S.S.R. has been claimed by Tass, the Russian news agency. Quoting the agency, Radio Moscow recently declared that 1947 output was 700 per cent over its 1940 gas output. No actual production figures were given.

Colon Output Down

Venezuelan crude oil production of Colon Development Co., Ltd., for the 4-week period ending December 29, 1947, was 334,524 bbl., or 11,936 bbl. daily. This compares with the production of 345,271 bbl., or 12,331 bbl. daily, for the 4-week period ending December 1, 1947. Highest daily production for Colon in 1947 was for a 4-week period ending in March, when output totaled 381,615 bbl., or 13,629 bbl. daily.

Oil Requirements of Marshall Plan Revised; New Report Due Soon

WASHINGTON. — Analytical estimates of the production potentialities, requirements, and probable availabilities of basic commodities over the period of European recovery were made public by the State Department January 7, but a study of petroleum which was to have been included was held up and will be issued separately within a few days.

Constituting a revision of all reports heretofore issued, by the committee for European Economic Cooperation and the Krug, Harriman, and Nourse committees, the reports, it was explained, "aim at realism and attempt to mark out the range of possible actions which will bring about the reactivation of the European economy in a feasible and practical manner." It was emphasized, however, that the new estimates of commodity requirements do not constitute a final decision.

The department made it clear that consideration has been given to the consequences of limited resource supplies on the European recovery program, pointing out that in some instances, notably iron and steel, it is believed the possibilities of achieving specific CEEC production targets in the first years of the program are imperiled because of raw material and equipment shortages. The Harriman committee took the same view, to the extent of suggesting that European requirements for oil might be less than anticipated by the CEEC, as a result of the inability to construct the facilities programed by the European countries.

"These estimates, based as they are on realistic appraisals of resource supplies, are also predicated upon the principle that the most efficient use should be made of commodities in scarce supply," the department said. "Therefore an attempt was made, in estimating production and requirements of the participating countries, to indicate a possible pattern of distribution of scarce and basic commodities which, in terms of amount, direction, and timing would make the greatest possible contribution to the reactivation of the European economy without at the same time jeopardizing the productivity of industry and agriculture in the United States and the rest of the world."

Although the petroleum report was delayed, some indications of the possible total of supplies to be furnished were given in estimates of the imports and domestic production of the 16 countries and the French and British dependent overseas territories during the four periods into which the program has been divided.

In the first period, from April 1, 1948, to June 30, 1949, it was shown, those countries may receive 29,274,000 metric tons of oil and products valued at $651,900,000 from the United States, and 34,236,000 tons valued at $683,400,000 from non-Western Hemisphere countries which, with their estimated domestic production of 2,431,000 tons, will give them a total supply of 65,941,000 tons.

(The report gave no factor for converting into barrels, but 1 metric ton contains from 7 to 7.5 U. S. barrels, depending on the petroleum product involved.)

Saar Will Be Included

In the fiscal year 1950, the Saar will be included for 52,000 tons and the total receipts of the aided territory as a whole may be 24,844,000 tons valued at $546,200,000 from the United States and 29,738,000 tons valued at $589,800,000 from other sources outside of this hemisphere. With their domestic production of 2,479,000 tons, this would give the European countries a total of 57,061,000 tons.

For the fiscal year 1951, it is estimated receipts may include 26,169,000 tons valued at $570,500,000 from the United States and 31,398,000 tons valued at $620,200,000 from other sources. Domestic production in Austria, however, is seen as falling off from an anticipated 902,000 tons in 1950 to 828,000 tons, and the total domestic output will fall back to 2,457,000 tons. Total supply, however, will be 60,024,000 tons.

In the final period, ended June 30, 1952, imports may be 27,628,000 tons valued at $537,000,000 from the United States and 38,493,000 tons valued at $709,700,000 from other sources. Austrian production is expected to fall off further, to 773,000 tons, and total domestic production to 2,459,000 tons, but the over-all supply will be 68,580,000 tons.

These estimates, accordingly, contemplate the provision from United States and other sources outside the aided areas of 215,145,000 tons of oil and products valued at $5,325,800 for the 16 countries during the life of the program and 26,635,000 tons valued at $582,900,000 for the French and British dependent overseas territories. In the same period, the nine countries which are oil producers are expected to provide a total of 9,826,000 tons.

Complications surrounding the petroleum equipment program have necessitated dropping this class of equipment as a scheduled item, the department said. However, since line pipe and casing were classified by CEEC as petroleum equipment rather than finished steel products, "token estimates" are included in the figures—400,000 metric tons valued at $209,200,000 in 1948; 480,000 tons valued at $252,100,010 in 1949; 460,000 tons valued at $242,900,000 in 1950; and 310,000 tons valued at $161,200,000 in 1951.

Warren Signs Conditional Contract to Buy Devonian

Contract for the purchase of Devonian Oil Co. by Warren Petroleum Corp. and Natural Gasoline Corp., a Warren affiliate, has been signed with Devonian stockholders representing about 60 per cent of the outstanding Devonian stock.

W. K. Warren, president of Warren Petroleum, said the contract calls for purchase of the stock at $65 a share and added that the same offer is being made to all Devonian stockholders.

Devonian has a daily production of about 6,000 bbl., principally in East Texas field and Slaughter and Goldsmith fields in West Texas. The company owns also more than 250,000 acres of undeveloped oil and gas leases and a natural-gasoline plant.

Zanesville Tool Buys Atha Interests in Ohio

Zanesville Tool & Supply Co. on January 3 acquired 67 gas and oil wells in Ohio and other properties from W. Hunter Atha Oil Co. for a reported price of $900,000.

About half the wells are oil producers. The wells are located in Muskingum, Perry, Morgan, and Guernsey counties.

B. R. Straker, Zanesville president, said the newly acquired properties will be operated by the newly formed Oxford Oil Co. J. W. Straker, son of the Zanesville president, will serve as manager of Oxford.

Du Pont Begins Sale of Tetraethyl Lead Compounds

E. I. du Pont de Nemours & Co. last week began marketing tetraethyl lead compounds to refiners.

The entrance of the company into the wholesale marketing field followed the expiration of basic patents on tetraethyl lead compounds held by Ethyl Corp. Du Pont has manufactured tetraethyl lead since 1923.

The company has opened two new general laboratories, one for road tests at El Monte, Calif., and one for engineering at Deepwater Point, N. M. Regional laboratories will be located in Houston and Chicago.

WASHINGTON WATCHING

BY BERTRAM F. LINZ

Oil and Politics

WASHINGTON. — Congress came back to Washington this week, packed for a long stay.

Leaders of both parties have abandoned hope of adjournment in time for the party conventions in July. Instead, Congress probably will recess over the convention period and, if its slate is not cleared, again for the campaign and election.

In a session in which the normal political maneuvering of a campaign year will be intensified by the bitterness engendered by the raising of Henry Wallace's third-party pennant, everything that Congress does this year will have a political hue, and every subject will become an "issue." That means the oil industry will get a political bouncing around, for petroleum will figure largely in discussions of foreign aid, domestic supplies, control of inflation, and many other matters.

All this will slow down action on the lengthy agenda which must be dealt with before the Eightieth Congress can close its books. It will prolong the consideration of the foreign aid program, the antiinflation legislation, tax reduction, universal military training, and other controversial subjects. It will play a part, too, in the handling of the dozen appropriation bills which are necessary to keep the federal establishment going, and more directly, politics probably will blue the air when tidelands legislation, revision of the Natural Gas Act, and other measures affecting the oil industry are brought up.

The importance of this situation to the oil industry and other business lies in the fact that the fights in Congress will not be between political parties but between three differing ideologies. Wallace's followers will not be strong enough to put any radical legislation over, but they may make it necessary for old-line Democrats and Republicans to work together at times to defeat their efforts.

Ball vs. Controls

THE oil industry has no occasion to fear that its efforts to develop a voluntary agreement to deal with the shortage problem will be used as the basis for adoption of any federal controls by OGD Director Max W. Ball, whose views are expressed elsewhere, but it can have little confidence that similar ideas prevail in other segments of the Government which will have roles in the antiinflation campaign.

At every opportunity, Ball has made it plain that his beliefs in private competition and the ability of the industry to meet its responsibilities have not been changed by recent developments. And he has made it plain, too, that he will not be swayed by any pressures which may be brought to bear in the future.

But elsewhere, there appears a tendency to view the voluntary agreement program as the stepping stone to stiffer measures which will call for Government intervention in industry. This tendency is most marked in the Commerce Department, which has been given the responsibility by President Truman of handling all commodities, other than oil, on which voluntary agreements are made.

Plans now under discussion provide for a major expansion of the department to handle the industry agreements and a large appropriation, reportedly in the neighborhood of $2,000,000, will be asked of Congress to finance the work.

It is with the Commerce Department that oil industry representatives in Washington believe difficulties may be encountered, particularly in the adequate presentation of industry needs for steel, and the big question right now is how the department will secure information and make a decision as to how much steel the industry is to be given.

Marshall Plan Delay

IT'S a good bet that final Congressional action on the Marshall Plan will come nearer June 1 than April 1, the "target" set by the Administration.

While House and Senate committees handling foreign affairs are expected to work on the legislation simultaneously, the appropriations committees are expected to take up the financial legislation only as it comes before their respective chambers, the House first, in conformity with Constitutional requirement.

The present legislative program is to get the basic bill developed first. This measure will embody the 4-year program, outlining the machinery for its administration and other details and authorizing the expenditure of whatever sum Congress decides will be necessary. The Administration is asking $17,000,000,000, but probably will have to settle for less.

Once this measure is out of the way, a companion bill actually appropriating funds will be drafted after a full study of requirements by the House Appropriations Committee. President Truman has asked $6,800,000,000 to run the European aid operation from April 1, next, to June 30, 1949, again with the probability of getting less. Once through the House, the bill will go to the Senate, where further hearings will be required preliminary to consideration on the floor.

As was the case with the interim-aid legislation, other committees will inject themselves into the picture as the Marshall Plan bills move along the Congressional assembly line, studying the impact upon domestic supplies and activities of the export of the volume of commodities and materials needed to put the 16 non-soviet nations of Europe on their feet.

Cooperation for War

MEMBERS of the oil industry are expected to play a prominent part in developing the plans for oiling the next war.

If and when that war comes, the industrial and civilian economy of the United States will be far more tightly controlled than during the last war, but industry itself is to have a say in what the controls should be and how they should be applied.

A policy of cooperation with industry has been laid down by the National Security Board, set up under the legislation unifying the armed services to plan for the effective use of the nation's resources in the event of war.

To the board has been assigned the job of finding out just what our resources are, in terms of raw materials, productive capacity, manpower, etc.; recommending steps to be taken to overcome existing shortages of materials prior to any future emergency, by stockpiling or other means, and developing detailed plans to cover the administrative machinery — policies, regulations, organizations, systems and procedures—necessary in case of war to effectively channel and control production for the war effort and at the same time protect to the maximum possible extent our civilian economy.

In this way, the board hopes to build up a register of men thoroughly familiar with the mobilization plans, who can be called upon in the event of an emergency.

PERSONALS

Chester Named Magnolia Production Head

A E. CHESTER, who began his career with Magnolia Petroleum Co. in August 1919 as a roustabout in the old Desdemona district, succeeded E. D. Smith as director, and as vice president and manager of production, effective January 1. Smith has retired after 29 years with Magnolia.

Chester worked up from roustabout to cleanout driller. In 1926 he was made foreman of the Iatan district, and in 1935 was promoted to district superintendent, with headquarters at Pampa, Tex. In May 1936 he moved to Clare, Mich., being transferred to Socony-Vacuum Oil Co., Inc.'s White Star division, for drilling and production work in Michigan.

Following the discovery of oil in Illinois, Chester was moved there and in December 1938 was transferred back to Magnolia as district superintendent at Salem, Ill. Shortly after that he was made division superintendent of the Illinois-Kentucky division. Chester was transferred to Dallas in January 1944 and made assistant manager of the producing division at that time.

J. P. Moroney, formerly in charge of the crude oil purchasing department of Sinclair Prairie Oil Co., at Tulsa, has been transferred to Denver where Sinclair Wyoming Oil Co. will open offices as headquarters for the Rocky Mountain states. He will be in charge of the company's activities and will have the title of vice president. **Alexander Johnston,** products pipe line department of Sinclair Refining Co., has been named to succeed Moroney as head of the crude oil purchasing department with title of vice president of Sinclair Prairie Oil Co.

John Stoker, production superintendent for Cia. Consolidada de Petroleo (Sinclair), early in January was scheduled to return to his headquarters at Maturin, Venezuela, after spending a short vacation in the United States.

H. C. Lay, district superintendent, production, for Shell Oil Co., Inc., has been transferred from Houston to Lake Charles, La. Other transfers in the production department include: **H. A. Johnson,** junior engineer, Lake Charles to Midland, Tex.; **A. W. Lampadius,** chief chemist, Tulsa to Houston; **R. P. Moscrip,** senior mechanical engineer, Wichita Falls, Tex., to Houston; **C. A. Bruce,** junior engineer, Houston to Donaldsonville, Tex.; **R. M. Carroll, Jr.,** junior engineer, Midland to Hobbs, N. M.; and **J. R. Curry,** junior engineer, Tulsa to Houston.

E. R. Sauermilch, junior geologist in the exploration department of Shell, has been promoted to geologist at the Houston district office. **J. E. Walker,** seismologist at Shreveport, has been promoted to senior seismologist. Transfers in the exploration department of Shell include: **E. J. Poizner,** junior geologist, Tyler, Tex., to Goodman Party. **R. S. Mahannah,** junior geophysicist, Vencil Party to Houston; **P. H. Bursk,** junior geophysicist, Houston to Hilton Party; and **J. D. Delbridge,** junior geophysicist, Houston to Vencil Party.

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Gavin Witherspoon, manager of producing operations for Bahrein Petroleum Co., Ltd., has been elected vice president of the company in charge of producing activities. Witherspoon began his career in California and entered the foreign field in 1936 as petroleum engineer in Arabia and Bahrein and later as assistant manager in Arabia.

Raymond A. Stehr, of Seaboard Oil Co., has been named president of the Dallas Geological Society for 1948. Other officers named include: **John T. Rouse,** Magnolia Petroleum Co., vice president; **H. V. Tygrett,** Atlantic Refining Co., secretary-treasurer; and **Barney Fisher,** Comanche Corp., executive committee member.

J. R. Evans, chief engineer for Stanolind Oil & Gas Co., was one of the three newly appointed division managers for the company, it was announced last week by **E. F. Bullard,** president of Stanolind. Evans has been named division manager of the North Texas-New Mexico division in charge of all operations, with offices in Fort Worth. He joined Stanolind in 1931 and in 1935 was made chief production engineer. Last year he was promoted to chief engineer for the company.

J. R. EVANS

R. E. NELSON, JR.

F. J. SCHEMPF

L. E. ELKINS

R. E. Nelson, Jr., executive assistant to the director of producing and manufacturing, has been named division manager of the Texas-Louisiana Gulf Coast division in charge of all operations, with offices at Houston. He was formerly unitization superintendent and in 1947 was promoted to executive assistant to director of producing and manufacturing.

F. J. Schempf, in charge of producing operations in the East Texas district for Stanolind, has been named division manager of the central division in charge of all operations with offices at Oklahoma City. He had served for 2 years as division manager of exploration for the Gulf Coast division.

Lloyd E. Elkins has been named chief engineer, producing department, to replace Evans. Elkins joined Stanolind in 1934 in West Texas. He was later transferred to Tulsa, where he became assistant chief production engineer. **C. F. Bedford** has been named as chief production engineer to succeed Elkins. **Glenn M. Stearns,** who joined Stanolind last year and had been associate professor of petroleum engineering at the Univer-

PERSONALS

sity of Oklahoma and had later served as engineer in charge of West Edmond pool operations, has been named development superintendent for the company.

J. W. FOLEY

James W. Foley, assistant to the manager of the producing department of The Texas Co. in Houston, has been appointed assistant manager of the Oklahoma division of the producing department effective January 1. Foley, who will have headquarters in Tulsa working under **M. J. Heald,** manager of the Oklahoma division, joined the company following his graduation from Texas A. & M. College in 1932. He became petroleum engineer in foreign operations on Bahrein Island from 1937 to 1940. Prior to his present job in Houston he was superintendent of gas-gasoline operations in the Louisiana division office in New Orleans.

Lloyd Hanson, superintendent for Arrow Drilling at Tyler, Tex., has been moved to Odessa, Tex., as superintendent for West Texas and New Mexico. He replaces **J. W. Hall,** who recently joined Trinity Drilling Co. **J. B. Daw,** toolpusher for Arrow at Pauls Valley, Okla., will go to Tyler as superintendent for East Texas district.

Vincent J. Moroney, formerly assistant division manager for Creole Petroleum Corp. at Maracaibo, Venezuela, has been transferred to Calgary, Canada, as operations manager for Imperial Oil Co., Ltd. Prior to joining Creole, Moroney had been in Peru for 15 years with International Petroleum Corp.

Dr. J. D. Lindsay, head of the department of chemical engineering, Texas A. & M. College, is the new chairman for 1948 of the South Texas section of the American Institute of Chemical Engineers, succeeding **Dr. Frank W. Jessen,** Houston consulting chemical engineer. **Dr. J. L. Franklin,** Baytown refinery, Humble Oil & Refining Co., has been named chairman for 1949. Other new officers are **L. B. Dampman,** Carbide & Carbon Chemicals Corp., Texas City, secretary-treasurer; and **W. A. Cunningham,** professor of chemical engineering, University of Texas; **W. P. Schambra,** Dow Chemical Co., Freeport; **B. I. Thorngren,** Maintenance Engineering Corp., Houston, and Jessen, members of the executive committee.

L. F. McCollum, president of Continental Oil Co., Ponca City, Okla., has been appointed by Secretary of Interior J. A. Krug as one of five new members to serve on the 70-man National Petroleum Council. Other new members of the group are: **L. S. Wescoat,** president of Pure Oil Co., Chicago; **H. S. M. Burns,** president of Shell Oil Co., Inc., New York; **Glenn E. Nielson,** president of Husky Refining Co., Cody, Wyo.; and **Robert G. Dunlop,** president of Sun Oil Co., Philadelphia.

J. H. WIMBERLY

J. H. Wimberly, vice president and treasurer of Houston Natural Gas Corp., has been elected to the newly created position of executive vice president. **Grover Jones,** company secretary, has been named secretary-treasurer, taking treasurer duties relinquished by Wimberly. Wimberly, a 1927 graduate of the University of Texas, joined Houston Natural in 1928 as chief clerk in the accounting department.

M. V. C. Bradley, general superintendent of production for Magnolia Petroleum Co., has been named to succeed **Andrew E. Chester** as assistant manager of production. Chester was recently named vice president and manager of production for Magnolia. He succeeded **E. D. Smith** whose resignation became effective January 1. **E. L. Downing,** formerly assistant general superintendent of production, succeeded Bradley as general superintendent of production. **R. D. Hanley,** former manager of the natural gas department for Magnolia, has been elected to the board of directors. Other changes in personnel of the company and division management are: **John F. Conley,** who has been named Kansas division superintendent to succeed **F. E. Mallonee,** who is retiring. Conley will also take over the former territory of the Illinois division which will be discontinued. **Louis Enloe** will be retired and operations in the Salem, (Illinois) district will be under the supervision of **Wade G. Moriarty,** district superintendent. **J. M. Courtney** will be retired and operations in the Rodessa (Louisiana) district will be under the supervision of **Walter M. Pittman,** district superintendent.

SHIFTS—

A. H. Ilfrey, engineer, Humble Oil & Refining Co., Avoca to Goose Creek, Tex.; **John E. Combs,** engineer, Signal Oil & Gas Co., Downey to Los Angeles, Calif.; **Frank J. Gibson,** superintendent, Rocky Mountain Drilling Co., Long Beach to Los Angeles, Calif.; **E. C. Yerby,** engineer, Richfield Oil Corp., Long Beach to Carpinteria, Calif.; **A. W. Abraham,** engineer, Richfield Oil Corp., Los Angeles to San Gabriel, Calif.

R. R. Hawkins, engineer, Standard Oil Co. of Ohio, San Marino to Los Angeles; **William T. Wells,** engineer, Gulf Oil Corp., Port Arthur, Tex., to Philadelphia, Pa.; **Julian H. MacDonald,** foreman, Stanolind Oil & Gas Co., Henderson to Levelland, Tex.; **Ralph H. Fletcher,** engineer, Gulf Oil Corp., Port Arthur to Groves, Tex.; **O. K. Harris,** engineer, Gulf Oil Corp., Port Arthur to Orange, Tex.

John H. Garner, engineer, Republic Natural Gas Co., Taft, Tex., to Hobbs, N. M.; **Charles R. Houssiere, Jr.,** superintendent, Sohio Petroleum Co., Lake Charles, La., to Houston; **H. L. Pelzer,** engineer, Sinclair Refining Co., Steger, Ill., to Gary, Ind.; **Arthur F. Endres,** superintendent, Standard Oil Co. of Indiana, Whiting, Ind., to Lansing, Ill.; **M. L. Hill,** foreman, Gulf Oil Corp., Yeadon to Boothwyn, Pa.; **W. H. Hackathorn,** superintendent, Hackathorn Drilling Co., Colorado Springs, Colo., to Salt Lake City, Utah; **H. R. Shannon,** superintendent, Carter Oil Co., Denver, Colo., Oklahoma City, Okla.; **Richard L. Peterson,** engineer, Stanolind Pipe Line Co., Casper to Douglas, Wyo.; **J. T. Gilliam,** foreman, Amerada Petroleum Corp., Cody, Wyo., to Plaquemine, La.; **O. I. Jantz,** foreman, Amerada Petroleum Corp., Hattiesburg, Miss., to Crowley, La.

DEATHS

Alphonzo E. Bell, 72, oil operator in southern California, who held extensive properties in the Santa Fe Springs field, died December 27 in Los Angeles, Calif.

Alexander Shaw Feild, 47, research engineer for Shell Pipe Line Corp. prior to his retirement about a year ago because of ill health, died December 31 in Houston.

Ernest A. Tietze, 70, retired accountant for Humble Oil & Refining Co., died December 30 in Houston.

Ira W. Montgomery, 65, early day drilling contractor in Osage County and a graduate of the University of Oklahoma in geology in 1906, died January 3 in Tulsa.

David Kennedy, 71, Oklahoma oil man with offices in Oklahoma City, died January 5 in St. Louis.

JET FUELS FOR AIRCRAFT

*by H. A. Murray**

This article has just been released by the Texas Mid-Continent Oil and Gas Association after being cleared for publication by The Texas Co. and the Department of National Defense. It discusses the latest data on a product of potentially great importance to all refiners.

THIS paper will attempt to cover the present and future fuel requirements of the aircraft gas-turbine type of power plant. As far as the fuel requirements are concerned the turbine or "turbo engine" is the same either as a jet engine or a turbo-propeller type of propulsion. This paper will not attempt to cover the fuel requirements of ram jets, pulse jets, or rocket forms of propulsion which are under military restrictions at the present time.

The adoption of the turbo engine in a majority of new or experimental models of aircraft instead of the piston engine is bound to affect the type of fuel which the petroleum industry will be called to supply in the near future. While the information on this subject is far from being complete at this time, there are, nevertheless, enough data to provide us with some of the general characteristics of jet fuels. This paper will cover some of the important physical properties such as volatility, fuel composition, stability, freezing point, and heating value. Discussions on fire hazard and availability are also included. Differences between the anticipated characteristics of jet fuels for military and commercial service are also summarized.

The sources of this information came from contacts with the aircraft industry (principally engine builders), airlines, work conducted by The Texas Co.'s laboratories at Beacon, N. Y., and Port Arthur, Tex., and several principal refineries. Some material came from two excellent papers presented this year—the first by C. G. Williams, of Shell Refining & Marketing Co., Ltd., England, (joint meeting of Institute of Petroleum and Royal Aeronautical Society, February 12, 1947)) and the second paper by C. R. Johnson of Shell Oil Co., Inc. (American Society of Mechanical Engineers, May 28, 1947).

*Technical and research division, The Texas Co., New York. An address before Texas Mid-Continent Oil and Gas Association, twenty-eighth annual meeting, San Antonio, October 17, 1947.

Volatility

Volatility is one of the most important physical properties of jet fuels. It is important because of its effect upon starting, combustion efficiency, engine deposits, evaporation losses, vapor locking, fire hazard, and even availability.

High rates of climb and high-altitude operation may be responsible for some appreciable losses of fuel from evaporation. A comparison between evaporation losses of aviation gasoline and a low-volatility fuel is shown in Fig. 1. Starting with a fuel temperature of 100° F. in a tank at the time of takeoff, it is apparent that appreciable losses may occur with aviation gasoline upon reaching altitudes in excess of 20,000 ft.—whereas the losses from a less-volatile fuel are insignificant up to 55,000 ft.

Vapor-locking tendencies of aviation gasoline at various altitudes are compared with those of low-volatility fuel (Fig. 2). Aviation gasoline will require fuel booster pumps to prevent vapor locking, whereas these pumps have not been found necessary when using a low-volatility fuel. If a fuel system has a vapor-liquid volume ratio of 2 and a fuel temperature of 100° F., it is apparent that with aviation gasoline booster pumps will have to be operated before reaching an altitude of 15,000 ft. to prevent vapor locking, whereas the same system would not require booster pumps up to 55,000 ft. with a low-volatility fuel.

While a volatile fuel such as aviation gasoline has some disadvantages with respect to evaporation losses and vapor locking, it has some distinct advantages found during low-temperature starting and combustion efficiency. The tolerance permitted in the front-end volatility varies widely from one engine to another and no general conclusions can be reached at this time. However, a certain amount of general information is available on a few of the more popular designs of jet engines which may be of interest. Aviation gasoline with an A.S.T.M. distillation 10 per cent point of 160° F. permits easy starting at temperatures down to —65° F. In the same type of engine, starting may be difficult at temperatures around —40° F. with a fuel having a 10 per cent point of 300° to 380° F.

During the starting period of a turbo engine richer mixtures are employed—a procedure which is similar to the piston engine. If the start of combustion is delayed, as it might be with a low-volatility type of fuel, the

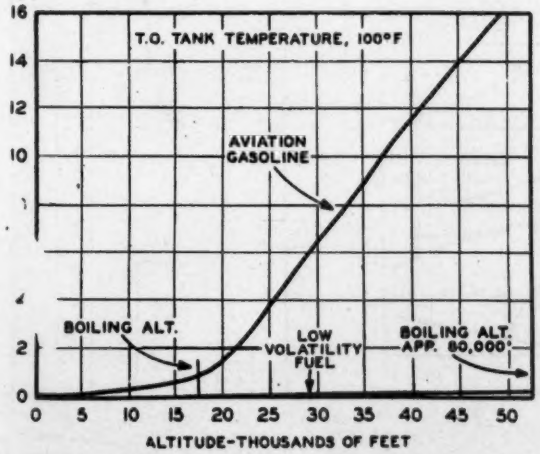

Fig. 1—Comparison of evaporation losses from aircraft fuel tanks when using current aviation gasoline and low-volatility fuel

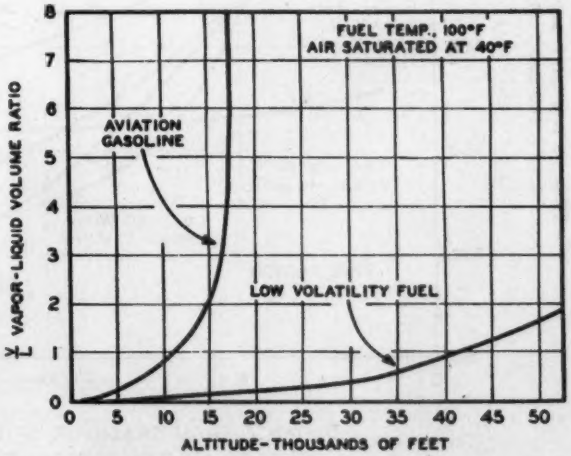

Fig. 2—Comparison of vapor formation in aircraft fuel system when using current aviation gasoline and low-volatility fuel

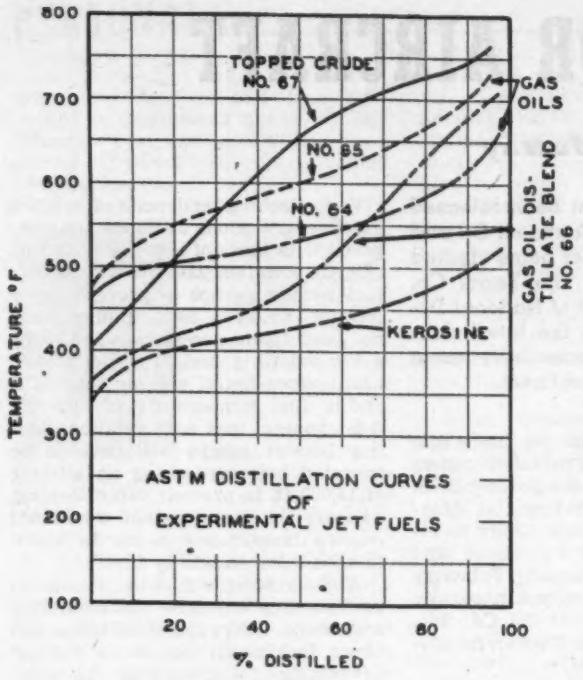

Fig. 3

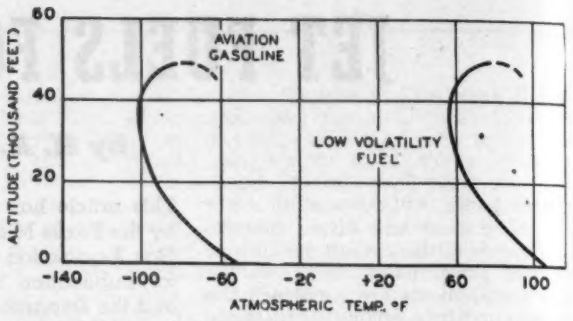

Fig. 4—Explosive limits of aviation fuels. (Curves apply to equilibrium conditions)

whole interior of the turbine engine may become drenched with unburned fuel which is apt to burn off suddenly once combustion has started, causing overheating or a "hot start." While hot starts can be reduced through changes in engine design and starting technique, they, nevertheless, depend upon fuel volatility. Hot starts are bad for the engine because of the overheating and subsequent damage to engine parts.

While some of the leading models of jet engines have been designed for satisfactory operation on either a low-volatility fuel such as kerosine or even gasoline, a few brief tests were conducted with heavier fuels to find out what might happen in regard to starting, combustion efficiency, and deposits. Tests with heavier fuels, Nos. 64, 65, 66, and 67 (Fig. 3), were run on one model of full-scale jet engine. The tests on this one engine are somewhat limited and not to be construed as applicable to other models of jet engines. With gas oil No. 64 (b.p. 464°-688° F.) starting was impossible at room temperature; although the engine would operate fairly well under cruising conditions at sea level if started on kerosine and switched over to this fuel. Combustion was poor under both idling conditions and rated speeds. With a heavier gas oil, No. 65 (b.p. 475°-724° F.+) starting was impossible and the engine would not operate under any conditions. The next heavy fuel tested was a gas oil-distillate blend, No. 66, having a much lower front end (b.p. 362°-715° F.) and this fuel started satisfactorily at room temperatures and permitted normal operation in the cruising range, although performance of the engine was not very good at idling and rated speeds. The heaviest fuel tested was a topped crude, No. 67 (b.p. 405°-750° F.+). It was necessary to start the engine with kerosine and then switch over to this fuel and poor operation was observed throughout the entire speed range under sea-level conditions. The burning characteristics of this fuel were so slow that the flame extended down through the turbine disk well into the tail cone assembly causing overheating and damage to these parts. Although this particular engine was designed to utilize kerosine, it is interesting to note what may be expected with some of the heavier gas oils.

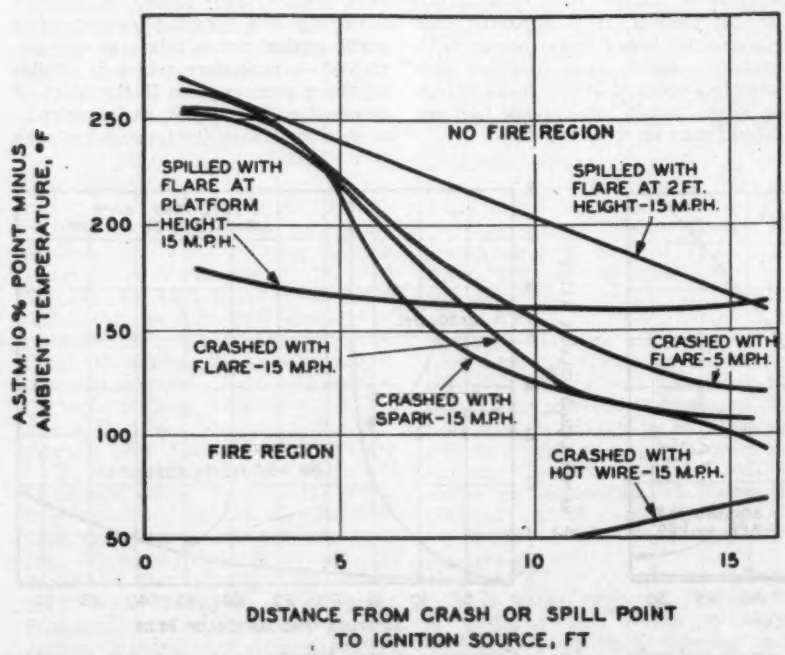
NO FIRE REGION
SPILLED WITH FLARE AT PLATFORM HEIGHT-15 M.P.H.
SPILLED WITH FLARE AT 2 FT. HEIGHT-15 M.P.H.
CRASHED WITH FLARE-15 M.P.H.
CRASHED WITH FLARE-5 M.P.H.
CRASHED WITH SPARK-15 M.P.H.
FIRE REGION
CRASHED WITH HOT WIRE-15 M.P.H.
A.S.T.M. 10% POINT MINUS AMBIENT TEMPERATURE, °F
DISTANCE FROM CRASH OR SPILL POINT TO IGNITION SOURCE, FT

Fig. 5—Borderline volatility for various types of tests and ignition sources

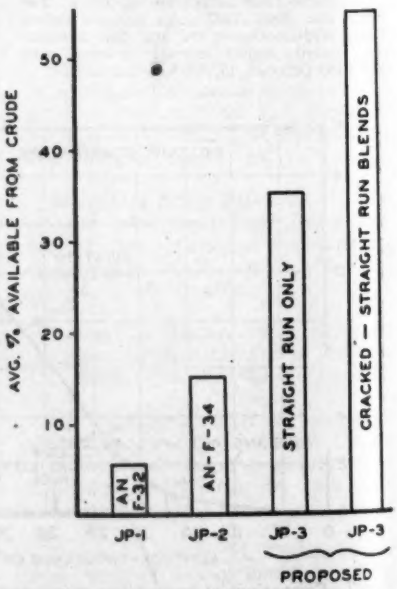

Fig. 6—Availability of jet fuels

Fire Hazard

Commercial operators believe that the turbo engine has advantages over the piston engine in its ability to use a less-volatile fuel and thereby reduce some of the fire hazards. It should be pointed out that any fuel which will burn in an engine will also burn outside under the right set of conditions and since no fuel can be regarded as absolutely fireproof, the term safety fuel is a misnomer. At the same time there appear to be some important differences between the inflammability of different fuels under certain conditions which will be discussed below.

The three types of fire hazards involving aviation fuels are as follows:

1. Explosion hazard of the vapors in the fuel tank.
2. Spontaneous ignition from contact with a hot surface.
3. Fires arising from spilled or crashed fuel covering the airplane or the ground.

A comparison between the explosive limits of aviation gasoline and low-volatility fuel appears in Fig. 4. Those data were obtained from tests at our Beacon laboratory using a hot wire as an ignition source in the vapor space. The solid line in these curves indicates the lean limit, and the broken line, which only partly completes the envelop, the rich limit of explosion. From those data, it appears that explosive conditions in the vapor space may be found with a low-volatility fuel under extremely hot weather conditions and also with aviation gasoline under extremely low-temperature conditions. Considering the wide variety of temperatures and altitudes under which aircraft operate today, the relative explosion hazards of both fuels are approximately the same. The use of an inert gas such as CO_2 or nitrogen has been proposed for the purpose of blanketing fuels if it is found necessary to prevent an explosive mixture from forming.

Similar tests in the same laboratory furnish some interesting information on other types of fire (2 and 3).

Results of a few samples which were crashed on hot pipe or manifold showed the following results:

	Minimum spontaneous ignition temp.
Aviation gasoline, 100/130	1,100° F.
Low-volatility fuel (300°-400° F.)	1,050° F.
Aircraft-engine oil 120	750° F.

Although heavy lubricating oil had a lower spontaneous ignition temperature than the gasoline samples, the latter burned more violently if the surface temperature was high enough to ignite both types. These demonstrations showed that oil fires were confined to local areas and spread very slowly, if at all. With gasoline, however, the spread of fire was almost instantaneous wherever the spray or vapors happened to go.

The effect of volatility on inflammability is illustrated in Fig. 5. This figure shows the borderline condition between fire and no-fire regions under various sources of ignition, wind velocities, and methods of cracking or spilling samples. The worst condition found was spilling fuel from a 2-ft. height into a lighter flare in the presence of a 15-m.p.h. wind. Under these conditions the borderline volatility between a fire and no-fire region was an A.S.T.M. 10 per cent distillation point minus an atmospheric temperature of 250° F. In other words, at 100° F. atmospheric temperature a fuel having a 10 per cent point of 350° F. would be borderline with respect to inflammability under these conditions.

It should be brought out at this time that there are no concrete data, based upon experience, of relative fire hazards of various fuels in aircraft. There is no operational experience available of a number of identical aircraft where part of the group used a volatile fuel such as aviation gasoline and the other a low-volatility fuel such as kerosine. Some attempts have been made to compare relative fire hazards of one model of aircraft using gasoline with another model of an entirely different design and engine using a low-volatility type of fuel. However, it is impossible to draw any conclusions from these examples due to the number of variables involved.

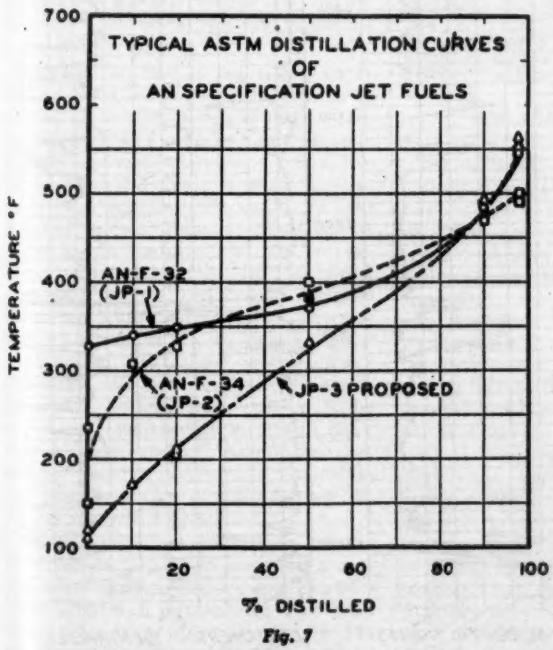

Fig. 7

Composition

From the limited amount of information available, it appears that fuel composition has some effect upon combustion efficiency, smoke, and deposits. Some of the more popular models of jet engines do not appear to be particularly sensitive in this respect. However, since engine design plays such an important part on the performance of fuels, any data obtained in one model of engine do not necessarily apply to another and, therefore, it is impossible to make any general conclusions at this time.

In two well-known models of jet engines, both paraffinic and naphthenic straightrun fuels are easier to burn than a highly aromatic type made from cracked stocks. For example, of three fuels with identical distillation range, similar to kerosine, but of different composition, paraffinic and naphthenic oils showed good combustion efficiency and freedom from smoke or deposits at various altitudes up to 40,000 ft. The aromatic fuel, containing approximately 50 per cent aromatics, was more difficult to burn and gave some smoking and rather objectionable deposits under sea-level conditions after a short period of testing.

The general feeling is that fuels containing aromatics up to 30 per cent may be satisfactory although many more data are necessary before any general conclusions can be reached. A great deal of information is needed studying the behavior of aromatic fuels of different distillation ranges. The behavior of olefins also must be carefully investigated before we will know whether cracked fuels may be successfully used in the turbo engine.

The principal disadvantage of the turbo engine compared with the piston engine is its higher fuel consumption. Since heating value of the fuel directly affects the range of aircraft, it is desirable to select a fuel of the highest heating value. Since the latest models of aircraft are becoming volume limited—i.e., less space is available for fuel tanks as a result of thinner wings, higher wing loading, and smaller fuselage—it appears that selecting a fuel of the highest B.t.u.'s per gallon is desirable.

A comparison between B.t.u.'s per gallon of aviation gasoline and three heavier fuels in the kerosine distillation range is given below:

	B.t.u. per gal.	Per cent inc. compared aviation gasoline
Aviation gasoline, 100/130	114,000	...
Kerosine distillation range:		
Paraffinic	126,700	11.0
Naphthenic	130,000	14.0
Aromatic	134,000	17.5

(Continued on page 110)

DEVELOPMENT IN TECHNIQUE OF

Cementing Casing

by G. E. McClatchey*

ONE of the major production problems in high-pressure areas, and in the Gulf Coast area in particular, is that of obtaining a uniform distribution of cement around the production casing. A seal must be effected between the casing and the formation which will isolate the productive zone from other permeable zones, above or below, which may have undesirable saturation. An effective seal is particularly important where a relatively thin oil column is overlain with gas and underlain with water, as is the case in many fields in coastal Louisiana and Texas.

When water, oil, and gas are in close proximity, a faulty cement column that permits vertical migration of fluids for only a few feet along the well bore may present serious operational difficulties. If the migration is from above, the well may produce with an excessive gas-oil ratio, or may even produce nothing but gas, even though perforations are correctly placed opposite an oil-saturated zone. If the migration is from below, the well will prematurely produce water, and expense of operation and production difficulties will be greatly enhanced.

Although complications arising from a faulty cement column are particularly acute if water, oil, and gas are all found in a relatively short vertical distance in a well, the migration of fluids up and down the well bore, through imperfections in the cement, is by no means confined to distances of a few feet. Occasionally well fluids travel several hundred feet, from high-pressure zones to producing zones of lower pressure, and are produced along with the fluids which originally saturated the formation opposite the production perforations. Thus either water or gas, or both, may migrate to the producing zone from either above or below the production perforations.

Frequently it is difficult for the operator to determine whether the undesirable production is coming from the formation opposite the production perforations, or from other zones up or down the hole. If foreign fluid or gas being produced via a faulty cement column is not recognized as such, well repairs that would otherwise be undertaken immediately may be delayed indefinitely, or may not be undertaken at all. This may result in greater operating expense, a reduced recovery from the well, and possible permanent well or reservoir damage.

If a cementing failure is recognized by the operator at the initial completion of a well, repairs are usually undertaken before the drilling rig is

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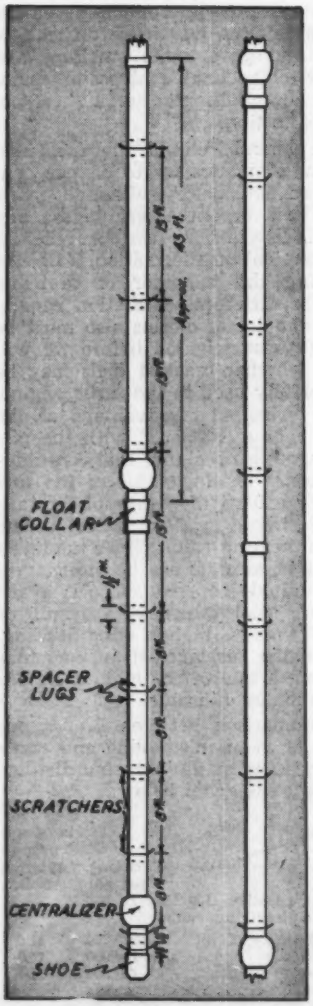

Fig. 1 — (Left) Schematic diagram of typical centralizer and scratcher installation on Range 3 casing

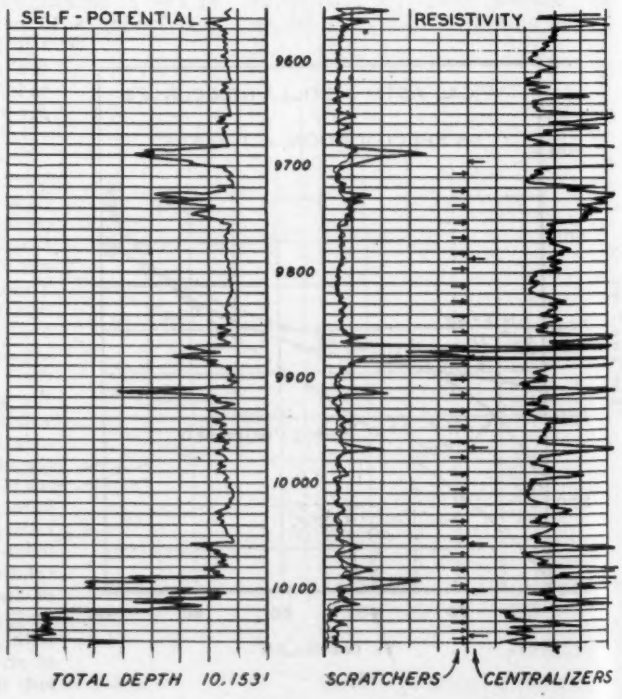

Fig. 2—(Right) Wall scratcher and centralizer placement and the electric log of a typical well in southwestern Louisiana

moved off the location. Usual procedure for repairing such a well involves squeezing cement or plastic out the production perforations to plug the channels through which the foreign fluids were gaining entry to the producing horizon. After a suitable waiting period for the plugging material to set, the well is reperforated in the desired interval. One such job may suffice to effect the desired results, but often the operation must be repeated several times to exclude the extraneous fluids from the productive zone. Frequently the productive zone appears to be isolated by cement at the time of the completion of the well, but subsequent lowering of the pressure in the producing formation, occasioned by fluid withdrawals, creates pressure differentials that start fluid movement through channels in a faulty cement column where a pressure balance had initially maintained static conditions. When this latter condition occurs, the cost of repairs is increased several fold, because the drilling tools have usually been moved out, and it is necessary to move in another rig for the workover operations.

Casing cementation failures have been so frequent that many operators make a practice of perforating and squeezing both above and below the pay zone before testing for production. This procedure costs several thousand dollars per well, but is considered by many to be good insurance against the necessity of an early workover. Occasionally, however, mechanical difficulties during squeezing result in fishing jobs involving expenditure of many thousand dollars additional. When such difficulties arise during the precautionary above and below-zone squeezes, abandonment of a zone is sometimes forced before it has been possible to obtain a production test.

During the last 2 years, the technique of cementing casing has been improved to such a degree that many operators, who formerly made precautionary squeezes above and below the productive intervals before testing for production, have discontinued that practice except under unusual conditions. When the operator can be reasonably sure that the initial casing cementation has effectively isolated the productive formation, the precautionary squeezes are no longer a good investment. If the precautionary squeezes can be eliminated, several thousand dollars per well will be saved, the wells will be on production a week sooner than otherwise, and the hazards involved in squeezing, and the possibility of well damage by squeezing, will be avoided.

Tools that have proved to be the most effective aids in improving casing cementation are casing centralizers and wall scratchers. The wall scratchers tear up and remove the wall cake, thus permitting the cement to make intimate contact with the formation. They also tend to deflect the cement and to break up channels, and to aid in the uniform distribution of cement around the casing. The centralizers provide protection for the scratchers, aid in bridging the casing over keyseats, and center the casing in the hole to permit the cement to be distributed uniformly around the casing. While the well scratchers and centralizers have been on the market for a number of years, it has been only within the last 2 or 3 years that systematic studies have been made to ascertain the extent of the benefits derived from their use, and to develop and to improve the technique of using these tools as an aid in the casing cementation. Studies by Teplitz and Hassebroek[1] revealed a remarkable reduction in the extent of channeling of cement during casing cementation when the casing strings were properly equipped with centralizers and scratchers, and gave an insight into the technique necessary to obtain desirable results using these devices.

Centralizers are usually welded to the casing; however, a new type recently introduced slides a limited distance along the casing in somewhat the same manner as the scratchers

Spacer lugs being spot welded on casing to limit scratcher travel to 18 in.

Wall scratchers in use today are of two general types: those designed to scratch the wall of the hole when the pipe is reciprocated,[1] and those designed to scratch the wall of the hole when the pipe is rotated.[2] The scratchers used in the work described in this article were all of the reciprocating type.

Formerly the majority of operators using scratchers spaced them over only that portion of the casing which would be opposite a productive interval during cementing, plus a few feet above and below that interval. Scratchers were usually placed 4 to

(Continued on page 76)

THE ROLE OF DISPERSANTS IN LUBRICATING OILS

by H. H. Zuidema*

In this article the author begins a discussion which will continue for three installments, in which he describes the part dispersants play in improving lubricating oils. A dispersant, he says, should, in addition to having good antiflocculant properties and the proper solubility and compatibility characteristics, be able to resist decomposition, either by the action of high temperatures, or by attack by oxygen or water.

STRAIGHT mineral oils are deficient in their ability to prevent deposition of lacquer and sludge under severe operating conditions, and it is general practice to correct this condition in heavy-duty oils by the incorporation of specific addition agents. Such oils are commonly known as "detergent" oils, and the additives responsible for this function are usually referred to as detergents.

These terms are misleading, since the adjective detergent means "cleansing" or "purging"; the function of the additives in question is primarily that of preventing deposition rather than that of removing deposits formed previously. Georgi[1] has suggested the term "dispersant" as being more descriptive. The term "antiflocculant" expresses the function quite accurately and would, therefore, be used in this paper, except for the fact that the use of dispersant has already been established.

Dispersants are defined as additives which prevent the flocculation or coagulation of colloidal particles. It should be understood that flocculation can occur either within the interior of the oil phase, with a resulting precipitation of large sludge particles, or on engine surfaces in the form of a resin or lacquer.

A dispersant may have detergent properties, but if it is added to a fresh oil which is placed into a clean engine it need function only as an antiflocculant for the insoluble materials pass through the colloidal state in the process of their formation, and the additive needs only to maintain the system in that state. However, it may exhibit some detergent properties if added to an engine containing deposits formed previously.

Pour-point depressants may be regarded as dispersants for wax particles, but these will not be included in this paper, which is limited to dispersants for insoluble oxidation and deterioration products in used lubricating oils. These insoluble products may originate either in the lubricant or in the fuel.

*Shell Oil Co., Inc., research laboratories, Wood River, Ill.

Historical

Of the five types of lubricating-oil additives mentioned by Wright in a recent publication,[2] dispersants constitute the most recent development. This is illustrated in Fig. 1, taken from Wright's recent patent survey, and in Table 1.

Fig. 1 shows that patents on dispersants began later and reached their peak later than the other four classes of additives covered. The decline since 1941 is probably due in part to the war. It will be observed that whereas patents granted are concentrated in the past 6 years and reached a peak in 1941, the peak with respect to application dates was reached as early as 1937.

The first commercial oil containing

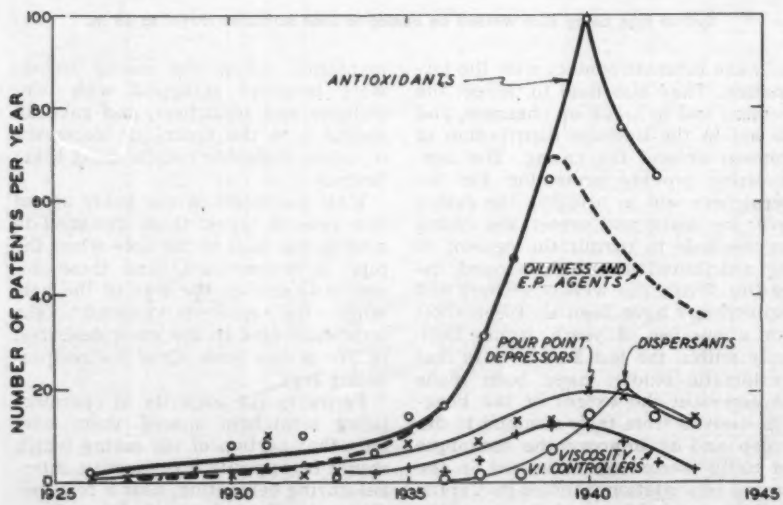

Fig. 1—Number of United States patents on lubricating-oil additives per year versus date. (Taken from Wright[2])

TABLE 1—UNITED STATES PATENTS ON DISPERSANTS

Year	Patents on dispersants applied for*	Patents on dispersants granted
1925	1	0
1926	0	0
1927	1	1
1928	0	0
1929	0	0
1930	0	0
1931	1	0
1932	0	1
1933	3	0
1934	3	0
1935	2	1
1936	3	2
1937	19	4
1938	14	1
1939	13	10
1940	12	14
1941	16	23
1942	5	13
1943	0	11
1944	0	12

*This includes only those patents granted prior to January 1, 1945.

a dispersant was introduced in 1935.[3] However, this oil was recommended for use only in engines equipped with babbitt bearings since it was very corrosive to cadmium silver and copper lead. The first dispersant oil which could be used with the newer bearings was introduced in 1939. Thus, while development work has been in progress for about 20 years, the first commercial application of dispersants in lubricating oils was only about 12 years ago, and their general application has been even more recent.

Engine Performance

Engine deposits may vary in intensity from thin lacquers, which are quite innocuous and which may be beneficial in reducing catalysis of oxidation by engine metals and preventing bearing corrosion, to heavy deposits which stick valves, rings, and tappets, and which may in extreme cases stick engines so that they cannot be turned over with the starter or by towing. Instances have been reported in which pistons and tappets were stuck permanently and could not be removed without damage to the parts.[4]

Since the purpose of adding a dispersant to an oil is to prevent deposition in the engine, many engine tests have been devised for evaluating oils designed for various applications, e.g., motor oils, and aircraft oils. These tests consist of running a given engine under a specified and carefully controlled set of conditions, and with a specified fuel, and examining the engine parts at the conclusion of the test. Full-scale engines are commonly used for final approval tests but small single-cylinder installations are preferable for development work because of their lower cost and greater simplicity.

Single-cylinder Lauson engines are used quite extensively for this purpose. Georgi[5] has reported cooperative test results from 19 laboratories. The test conditions used in that work varied to a considerable extent. Speed varied from 1,200 to 1,800 r.p.m.; load from 1 to 3 hp.; oil temperature from 212° to 320° F.; jacket temperature from 170° to 400° F.; and the duration of the test from 24 to 144 hours.

On the basis of these cooperative tests on six oils it was concluded that oil temperature, jacket temperature, and the duration of the test are the most important factors. Engine speed and load were found to be less critical. Georgi tabulated three sets of operating conditions which represent general averages of the conditions used by those laboratories which reported the most consistent results on the six oils. These are given in Table 2.

Conditions A and B differ only in temperature. The former employs a relatively high oil temperature and relatively low jacket temperature, whereas the latter uses a lower oil temperature but a much higher jacket temperature. Procedure C differs from B only in that the jacket temperature has been raised an additional 50°-55° F. and the duration of the test reduced.

TABLE 2—AVERAGE TEST CONDITIONS FOR LAUSON ENGINE
(From Georgi[5])

	A	B	C
Oil temperature, °F.	280	225	225
Coolant temperature, °F.	180-200	345-350	400
Test time, hours	100-120	100-120	24-48
Engine speed, r.p.m.	1,600-1,800	1,600-1,800	1,600-1,800
Load, hp.	1.3-1.6	1.3-1.6	1.3-1.6

Forty-hour Lauson tests have been used for some time at Wood River for studying lacquer deposition on piston skirts and connecting rods. Oil temperature and jacket temperature at 285° and 212° F., respectively, are normally employed. At the completion of the test the engine is disassembled and the piston and connecting rod rated according to the following **"point score"** system:

No lacquer	10
Light and transparent deposit	8
Light deposit, straw to tan in color	6
Medium deposit, golden brown	4
Medium-heavy deposit, red-brown to deep brown	2
Very heavy deposit, dark brown to black	0

An average is taken for ratings at seven different areas. These include the following:

Piston skirt:
1. Thrust side.
2. Antithrust side.
3. Pine-hole regions.

Underside of piston:
1. Crown.
2. Skirt and pin bosses.

Connecting rod:
1. Big end bearing region.
2. Recessed sections of rod.

There are a number of factors which influence lacquering in the engine. These are discussed in the following two sections, the first of which takes up the formation and the second the deposition of oil insolubles. Both steps are necessary for the production of lacquer.

Factors Influencing Formation of Oil Insolubles in an Engine

1. Composition of fuel.—While the problem of lacquer formation in engines was originally thought of as involving solely lubricating oils, it has been known for some time that the composition of the fuel may be an important factor. This is true both in diesel and in spark-ignition engines. Bouman[6] pointed out as early as 1933 that lacquer formation on the pistons, cylinder liners, etc., in diesel and hot-bulb engines is due to the incomplete combustion of the fuel at low loads, and not to the lubricating oil. Cloud and Blackwood[7] have studied the effect of various fuels upon deposition in high-speed diesel engines, and concluded that sulfur content is the most important factor. Other properties which influence deposition included ignition quality, viscosity, and/or volatility.

Possibility that gasoline gum accumulating from diluent in the crankcase oil may be a factor in the formation of lacquer was pointed out by Gruse and Livingstone[8] in 1939. Importance of the gasoline in determining lacquering tendencies in spark ignition engines is now generally recognized. Mougey[9] has recently shown, as far as lacquering and sludging are concerned, that the fuel is of particular relative importance in engines operating at moderate temperatures. At high temperatures the oil rather than the fuel is primarily responsible for lacquering and sludging.

Influence of the composition of the fuel upon lacquering in the Lauson engine under a given set of operating conditions is demonstrated in Table 3. It will be observed that fuel B, which was a commercial cracked

(Continued on page 77)

TABLE 3—EFFECT OF FUEL AND LUBRICANT ON LACQUER RATING
(40-hour Lauson tests: Oil temperature 285° F., jacket, 212° F.)

Lubricant—	Gasoline	Avg. lacquer rating*
1. White oil	A	8.9 (9.2, 8.7)
White oil	B	6.7 (7.5, 6.2)
2. Duo-Sol extracted S.A.E. 20	A	8.8
Duo-Sol extracted S.A.E. 20	B	6.4
3. Duo-Sol extracted S.A.E. 10	A	4.9 (5.3, 4.6)
Duo-Sol extracted S.A.E. 10	B	2.5 (2.9, 2.4)
Change in lacquer rating with change in fuel, Lubricant 1		2.2
Change in lacquer rating with change in fuel, Lubricant 2		2.4
Change in lacquer rating with change in fuel, Lubricant 3		2.4
Change in lacquer rating with change in Lubricant 1 to 2, Fuel 1		0.1
Change in lacquer rating with change in Lubricant 1 to 2, Fuel 2		0.3
Change in lacquer rating with change in Lubricant 1 to 3, Fuel 1		4.0
Change in lacquer rating with change in Lubricant 1 to 3, Fuel 2		4.2
Change in lacquer rating with change in Lubricant 2 to 3, Fuel 1		3.9
Change in lacquer rating with change in Lubricant 2 to 3, Fuel 2		3.9

*For scale of lacquer rating, see discussion on "point scale" above.

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Fig. 1—(Left) Simultaneously running of 7,000 ft. of ¾-in. and 2-in. tubing into General Crude Oil Co. A-41 Esperson in Esperson Dome field, Liberty County, Texas, required only 16 hours. This photograph shows method of clamping tubing together. Fig. 2—(Right) Running of parallel tubing strings facilitated by special split spider and slips

HYDRAULIC Installation and Servicing of OIL-WELL PUMPS

by Ed Short

THE free-type pumping method, under development and testing for the past 8 years, was introduced on the Gulf Coast during the latter part of September 1947. In this area, where servicing operations on the deep pumping properties represents a substantial part of lifting costs, operators have been quick in utilizing a system which eliminates the mechanical pulling and running of pumps. At the present time, a little over 2 months after introduction, the free-type pumping method has been installed in a number of wells in North Thompson, Esperson Dome, Jennings, and Anahuac fields.

In these applications, instead of a four-man service crew to pull the power-oil string, which was necessary under the initial system of hydraulic pumping to recover a pump, a pumper may pull a pump by merely turning a valve and diverting the power-oil fluid to the bottom of the pump. The system is termed "free pumping" because the handling of the pump both in and out of the hole does not require the usual mechanical connection with the surface.

One of the most recent installations of the free-pumping system was made in General Crude Oil Co. A-41 Esperson, located in Esperson Dome field, Liberty County, Texas. This well, equipped with 5½-in. casing, has a total depth of 7,980 ft. and pumps from a depth of 7,000 ft.

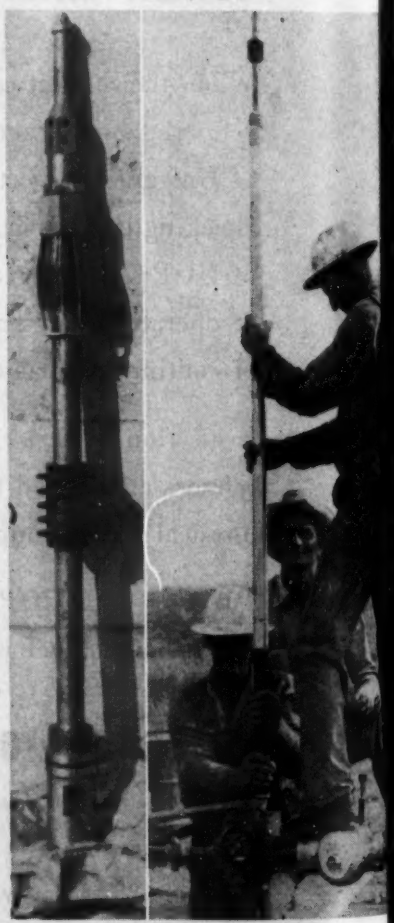
Essential difference between the conventional Kobe pump installation and the free-pumping system is that the smaller-sized tubing, instead of being installed inside the larger string, is clamped to and run parallel to the larger size. The tubing strings in A-41 Esperson consist of ¾-in. upset clamped to the outside of the string of 2-in. tubing. The running of these two strings simultaneously to a depth of 7,000 ft. required only 16 hours. One clamp per joint is necessary to fasten the two strings together and the installation is greatly facilitated by the use of special split spider and slips.

The two strings of tubing are connected together at the bottom ends by a shoe housing. A standing valve located in the housing can be pulled by means of a fishing tool on a small wire line.

When the tubing was set at 7,000 ft., a four-way plug-type manual valve was installed at the surface on the two strings of tubing, and the surface power oil and production lead lines tied in. With this valve, the flow of power oil can be directed either down the large string or the small string with the other string being simultaneously connected to the surface lead line. Also a third position of the manual valve shuts off both the surface lines and opens the parallel tubing system to atmosphere. A quick-acting plug can be removed from the top of valve block giving a full-diameter opening into the top of the 2-in. tubing. Incorporated in this removable plug is a latch-type catcher and an indicator to show when the catcher is engaged.

The conventional Kobe pump is used in the free-pumping system, the only addition being an extension con-

Fig. 3—(Left) In placing a well on free pumping, the only addition to the conventional Kobe hydraulic pump is this extension or pumpout packer which screws into the top of the pump. Fig. 4—(Right) Pump is inserted into 2-in. tubing by tubing crew preparatory to pumping to bottom. Subsequent pump installations will be handled by pumper, since only one man is required to run or to pull pump



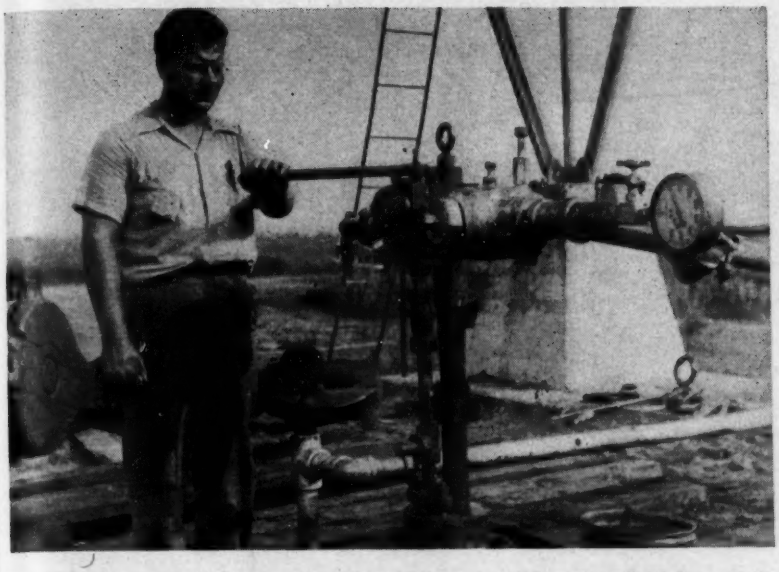


Fig. 5—The four-way plug-type valve used on "free pumping" wells. Bill Wallace, Kobe, Inc., demonstrates method of diverting flow of power oil down either string of tubing, the other string being simultaneously connected to the surface lead line. A third position on manual valve shuts off both the surface lines and opens the parallel tubing system to atmosphere

Fig. 6—Centrally located 40-hp. triplex pump supplies power oil at approximately 2,500 psi. This small unit has capacity for handling four wells comparable to A-41 Esperson

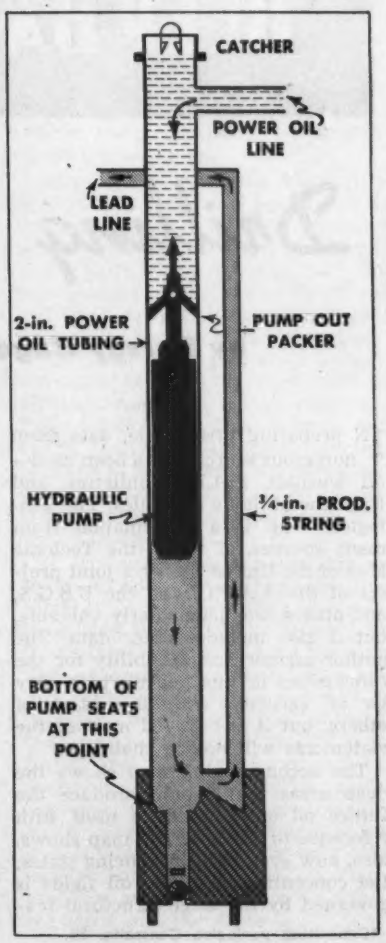
taining an "O" ring seal and a pumpout packer which screw into the top of the pump. The pumpout packer contacts the walls of the 2-in. tubing.

In the conventional hydraulic pumping system the small tubing (installed inside of larger tubing) acts as the power-oil string. In the free-pumping system, however, the larger-size tubing, or 2-in. in the case of A-41 Esperson, receives the production unit and acts as the power-oil string. The production fluid rises through the small string.

In placing A-41 Esperson on production, oil was admitted at the surface which filled both strings of tubing. With the standing valve closed and the two strings standing full of fluid the system resembled a U-tube. The production unit was then inserted and the catcher plug replaced. Power oil was then admitted into the 2-in. tubing in order to force the production unit or pump downward. Pumping at a 28.4-bbl.-per-hour rate the pump was landed on bottom, seated, and sealed in the tapered intake opening in a period of only 47 minutes. The flow of power oil was continued and entered the engine end of the unit, and the well started pumping. With the final stroke the standing valve in the intake passage is lifted from the seat and held off the seat by a small permanent magnet. This prevents wear or damage to the seat while pump is in operation.

At the time this installation was made, a test was made to determine the time which would be required for pulling the pump. This operation was effected by turning the four-way valve at the surface to a pumpout position, which diverted the power-oil pressure downward through the small string, or ¾-in. tubing. This applied pressure underneath the unit against the net area of the "O" ring area minus the seating area at the intake and caused the unit to be lifted from its seat and a quick flow of fluid out through the standing valve overcame the holding force of the magnet, causing it to close, thereby establishing the U-tube. Continued circulation underneath the unit brought it to the surface in 69 minutes. A round trip for a conventional pump would require approximately 8 hours with a four-man crew, or 32 man-hours. On this particular well the free-type pump could be roundtripped in about 2½ man-hours, allowing for 20 minutes between surfacing the old pump and starting a new one into the tubing.

Fig. 7—This illustrates pump being pumped down tubing. The ¾-in. string acts as production string. To pull pump, power oil is pumped down ¾-in.



Drilling the DEEP Areas

by Dorsey Hager*

IN preparing this article, data from numerous sources have been used—oil journals, A.A.P.G. bulletins, and from the author's own files. The geological map is a combination from many sources, of which the Tectonic Map of the United States, a joint project of the A.A.P.G. and the U.S.G.S. and others, was particularly valuable, but it also includes other data. The author assumes responsibility for the conclusions in this paper which may be at variance with the ideas of others, but it is believed most of the statements will not be challenged.

The accompanying map shows the deep areas that should produce the future oil and should be used with reference to Table 1. The map shows, also, how even in oil-producing states, the concentration of the oil fields is governed by the large structural features. One has only to note the old Trenton fields along the Findlay arch, and along the offshoot of the Cincinnati uplift which continues as the Kankakee arch, to appreciate that the control there is structural. In New York, western Pennsylvania, West Virginia, and eastern Ohio, the Appalachian geosyncline is the dominant feature, with the local gas and oil concentrations controlled by minor structural and stratigraphic features. One can carry this relationship through all the oil areas. The basins are the principal features, but they are, of course, on the flanks of big mountain ranges, or on the flanks of large uplifts.

It is interesting to note that the oil concentrations are sometimes more limited than would be expected. Local structural and stratigraphic conditions control in such instances. The concentration of fields in West Texas and in Southeast New Mexico is very noticeable, as are the concentrations in Kansas and Oklahoma, where the western portions of the states show large spaces with few if any fields, even though there has been much drilling. New fields will yet be found in such areas, but there is no reason to expect the heavy concentrations found in other parts of the states.

Deeper drilling has been advocated and practiced for some years, but deeper drilling has its limits. It was once thought, even as late as 1915, that tests below 8,000 ft. would find the sandstones and limestones so tight that they could not carry oil or water. That idea has been exploded in the western basins. Another theory was that the deep basins which have proved so prolific in recent years were water logged, and all the oil was driv-

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TABLE 1—MAIN DEEP AREAS OF UNITED STATES

State and name of area—	Est. maximum thicknesses of sediments (ft.)	Chances of finding commercial oil in deepest part
Washington-Oregon:		
Washington-Oregon	40,000	Slight
California:		
Ventura Avenue area	30,000	Good to 20,000 ft. plus
San Joaquin-Sacramento basin	65,000-75,000	Good to 30,000 ft. plus
Imperial Valley	17,000	Very slight
W. Carrizo Plain	40,000	Fair to 20,000 ft.
Los Angeles Basin	15,000+	Good to basement
Montana:		
South Central basin	12,000-15,000	Possible to granitics
Wyoming:		
Big Horn basin	17,000	Good to Madison limestone
Powder River basin	18,000	Good to Madison limestone
Wind River basin	20,000	Good to Madison limestone
Green River basin	40,000	Good to Madison limestone
W. Colorado-Utah:		
Uinta basin	20,000	Fair through Pennsylvanian
Colorado River-Salt Basin	10,000	Fair through Pennsylvanian
Arizona:		
Black Mesa basin	8,000-10,000	Possible through Pennsylvanian
W. New Mexico:		
San Juan basin	14,000-15,000	Fair through Pennsylvanian
E. Colorado:		
Denver basin	20,000	Fair through Pennsylvanian
N. and S. Dakota:		
Williston-Lemmon	15,000	Fair through Ordovician
Kansas-Nebraska:		
Forest City-Salina basin	4,500-5,000	Some chances to Ordovician
Oklahoma:		
Anadarko basin	25,000+	Good into Arbuckle limestone
Texas:		
South Texas-Gulf Coast	25,000+	Good
West Central Texas	5,000-15,000	Good
North Texas	6,000-10,000	Good
Delaware basin	20,000	Good
Midland basin	18,000	Good
Illinois-Indiana:		
Illinois basin	10,000-12,000	Some chances to Cambrian
Michigan:		
Michigan basin	13,000-14,000	Fair chances through Trenton
Penn.-W. Va.:		
Appalachian geosyncline	30,000+	Fair through Ordovician
Louisiana:		
South	25,000+	Good
Mississippi:		
South	20,000+	Good
Alabama:		
Southwest	15,000-20,000	Fair
Black Warrior basin	12,000+	Fair
Georgia:		
Southeast	5,200	Slight possibilities
Southwest	8,000	Slight possibilities
Florida:		
Southern	20,000+	Fair

en to the rims, but that early theory has also been upset, so that now, such basins are the preferred places for exploration instead of just on the rims.

Speed of Rotary Drilling

Rotary tests to depths of 10,000 to 12,000 ft. today are drilled more rapidly than were the 4,000-ft. cable-tool wells of a generation ago. This has enabled oil men to drill deep holes, the deepest now reported being Superior Oil Co.'s test in the Anadarko basin situated 5 miles north of Fort Cobb, Caddo County, Oklahoma. This hole was completed dry at 17,823 ft. The cost of such deep drilling and development are very high, as present drilling in the Anadarko basin of Oklahoma proves.

In California, there is no reason why in a few places, such as in Ventura Avenue field, production may not occur at 18,000 to 20,000 ft. in depth, and in parts of the San Joaquin Valley, very deep fields may also be opened. The areas open to such deep drilling, however, are limited, and deep drilling will be expensive.

The deeps of the San Joaquin and the Sacramento valleys (65,000 to 70,000 ft.) are out of reach of the drill, a condition which applies to most basins over 20,000 ft. in depth, at least for some years to come.

In Colorado, the maximum depths in the Uinta and in the Denver basins should be reached around 20,000 ft., and in Wyoming, the Big Horn and the Powder River basins can be tested at about 20,000 ft. The deep of the Green River basin is, however, 40,000 ft. or more. The Black Mesa of Arizona and the San Juan basin of New Mexico can be tested around 10,000 ft. The Lemmon-Williston basin of the Dakotas, which is an extension of the Regina basin of Canada, has had one fairly deep well, the California 1 Kamp which was situated 30 miles east of Williston, N. D. It was drilled to 10,281 ft. and stopped in Devonian rocks. The thickness of sediments in the deep of that basin is estimated to be 14,000 to 15,000 ft.

Basement beds in the Michigan basins are around 13,000-14,000 ft., well within drilling reach. However, the deepest beds of the Appalachian basin, beds 30,000 ft. or more deep, are out of reach. The thickness there would at first appear promising for holes to 20,000 ft., but the older beds tested on the edges of the basins are lacking in water, and do not appear favorable. However, without some deep tests, conditions in the basin are largely surmise. The Oriskany (Devonian) gas sand has been productive over a wide area, and only moderately deep—4,500 to nearly 8,000 ft. It was first developed in 1931 in northern Pennsylvania, but it is now productive in West Virginia. Whether or not the Clinton and other sands of Ohio, and the Trenton lime will be found to produce in the basin, future testing alone will determine.

Sediments Not Productive

It must be kept in mind, however, that even if traps are found within the basins, the sediments may not prove productive of gas or oil below the present producing horizons. At best, only the deepest parts of the basins will be out of reach of the drill if 20,000 ft. can be reached. In all of the deep basins and the Gulf Coastal area, not over 10,000,000 acres lie below 20,000 ft. Much of this area carries productive fields above 15,000 ft. Considering that 1 acre in 100 of the deeper beds might produce oil, only 100,000 acres of oil territory are below 20,000 ft.—certainly a very small proportion, perhaps 2 to 3 per cent of the great productive acreage of the United States.

Also, it may be found that, after several deep tests have been made in the basins, even where the granitics or the metamorphic rocks are penetrated at 20,000 ft. or under, that the deep horizons are totally barren of gas and oil. A few properly situated tests on definite highs will soon "cool off" further deep tests, just as at present, operators are cool to deep tests in Williston basin, the Illinois basin, the Michigan basin, the Denver basin, and others. Sooner or later, such tests will be made in the deeps of all basins, but definite structural features will largely determine whether or not such tests should be made.

It is easy to discuss drilling of 20,000-ft. holes, but where the first 15,000 ft. of the top drilling is in relatively soft beds, and the lower 5,000 ft. are largely limestone, the holes are very expensive. A million and a half to 2 million dollars or more may be necessary to complete such holes. If the "pay" is sufficiently prolific, holes costing that much will be drilled, but operators must see profits ahead. However, if such deep oil costs too much to produce, the major concerns will obtain their products from bituminous and lignitic coals, oil shales, and "tar sands" which in California are thick and numerous.

COOLING-WATER REQUIREMENTS

for Natural-Gas Booster Stations

by A. V. Mueller*

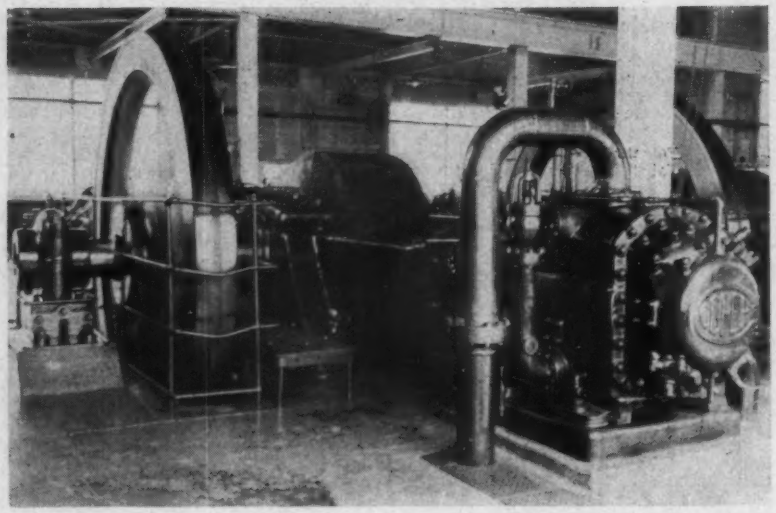


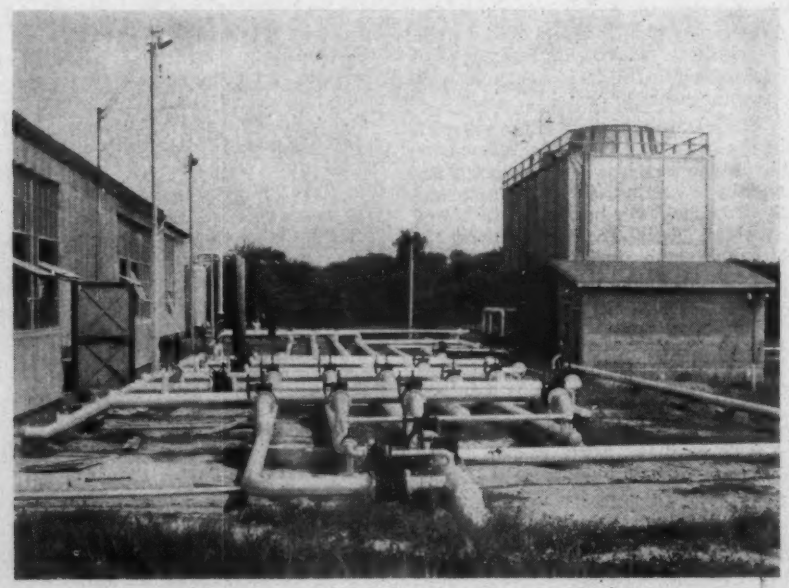
Fig. 1—Interior view of the Ashland station. Engines operate on natural gas

THE station described in this article belongs to the Columbia Gas System and is operated by Ohio Fuel Gas Co., Ashland district, A. R. Fitzgerald, chief engineer. It is of special interest in that all water pumping for the plant is done exclusively by turbine pumps.

*Manager centrifugal and turbine department, The Deming Co., Salem, Ohio.

This paper was delivered at the October meeting of the National Association of Vertical Turbine Pump Manufacturers. It presents an interesting description of water pumping installations in gas booster-plant construction which afford good economy and efficiency in relation to the overall operation of such plant.

Fig. 2—Cooling tower and concrete reservoir. The small building of 10 by 22-ft. floor space houses four of the turbine pumps



The older of the Columbia Gas System's stations are equipped with regular centrifugal pumps, such as vertical sump pumps of the dry-pit type and horizontally split casing double-suction pumps. Both types require more space than the vertical turbine pumps which are submerged and do not need foot valves nor suction lines, and are always primed and ready to start.

With the saving of space and good over-all efficiencies possible, the Columbus district engineer, F. F. Fisher, decided to try several stations in his territory with close-coupled turbine pumps. The three Columbia network stations located near Mansfield, Ohio, within a radius of 25 miles, were all equipped with turbine pumps (Deming). Ohio Fuel Gas Co.'s plant is a so-called "B" station, pumping to the Pavonia plant, an "A" station, which is the main station and collects gas from all others in the neighborhood and delivering direct to the market.

Gas received at the Ashland district station comes from about 600 wells of a maximum radius of 20 miles. The gathering system from these wells is a network of small and larger pipes, finally reaching the station in two 12-in. lines (one from the high-pressure field, the other from the low-pressure field). Pressures under which the gas reaches the station vary, ranging from 14 to 80 psi.

Station Equipment

The Ashland station is equipped with the following machinery units: One gas cleaner (Blaw-Knox), two 450-hp. Worthington Snow engines, one 1,150-hp. Worthington Snow-Duplex engine, one 350-hp. Cooper-Bessemer gas engine (see Fig. 1). These engines are operated on natural gas and are directly coupled to compressors. Engines and compressors are jacketed for water cooling. There is one double cooling tower (Marley) with two fans for induced draft, and six turbine pumps (Deming) as follows: Two 12-in. two-stage, 1,000-g.p.m. against 60-ft. head, 20-hp. at 1,750 r.p.m. for engine and compressor jacket cooling; two 16-in. one-stage, 1,500-g.p.m. against 30-ft. head, 15-hp. at 1,150 r.p.m., for pumping warm water over cooling tower; one 8-in. two-stage, 250-g.p.m. against 30-ft. head, 3-hp. at 1,750 r.p.m., for water supply from pond to cooling tower basin, and one 10-in. one-stage, 500-

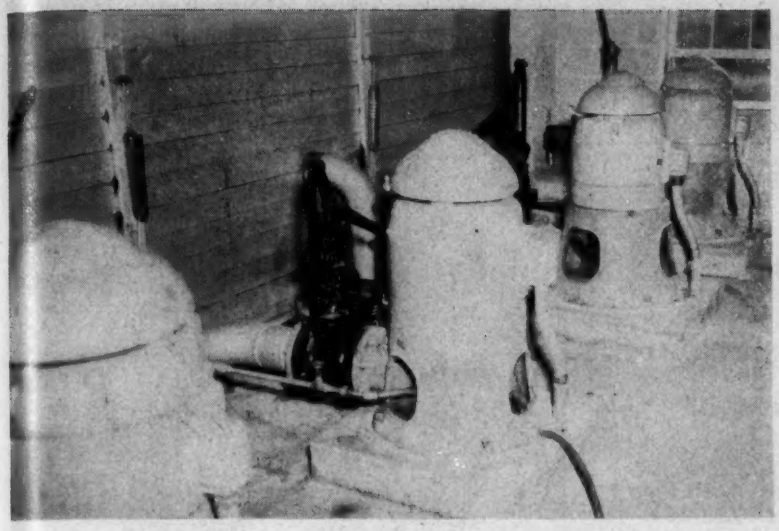


Fig. 3—Motors and discharge heads of two 1,000-gal. and two 1,500-gal. pumps

g.p.m. against 30-ft. head, 5-hp. at 1,750 r.p.m. for replenishing pond from river ½ mile away.

The entering gas is scrubbed by the gas cleaner, and proceeds to the compressors, usually at 14 psi.

The cooling tower is of wooden construction (essentially redwood) 35 ft. high, 46 ft. long, and 22 ft. wide. The concrete reservoir under the tower is 7 ft. deep and extends on one end 10 ft. beyond the tower (see Fig. 2).

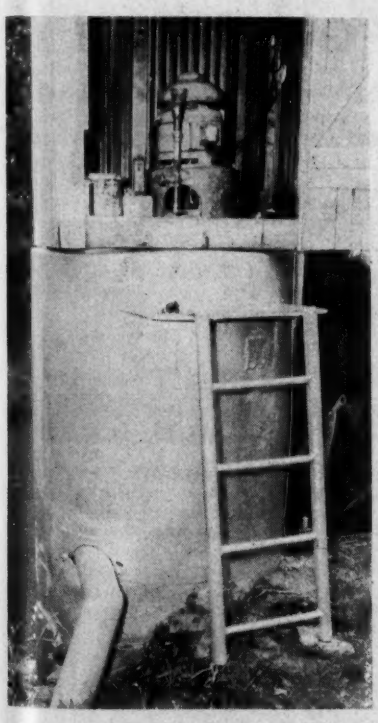


Fig. 4—The river pump is located on the river bank ½ mile away from the gas station. It is protected from the weather by a steel shed

duplicates of these and to equalize wear, operate on alternate weeks with the first two. Distance from pump house floor to the bottom of the Keystone strainers of each of these four pumps is 7 ft.

First stage of compression raises the pressure from 14 to 68 psi. Leaving the compressor the gas has a temperature of about 200° F. and is conducted through a 12-in. steel pipe line to an intercooler consisting of four horizontal banks of ⅞-in. copper tubes (total of 360) connected to inlet and outlet headers. This intercooler is located in the first cooling-tower compartment described above.

The lower section consists of two banks, or 180 tubes, and is 3 ft. above the top of the foundation; the upper section consists of the same number of banks and tubes and is located 2 ft. above the lower section.

The gas, after passing through the 360 tubes of the intercooler, returns under a pressure of 68 psi. to the pumping station and is further compressed to 198 psi. It leaves the compressor with a temperature of 200° F. and returns to the aftercooler, located in the same compartment of the cooling tower as the intercooler. Here it goes through a set of ninety-eight ⅞-in. copper tubes arranged in two banks, one above the other, similar to the 360 tubes of the intercooler. When leaving the cooling tower the gas is under 198 psi. pressure at a maximum temperature of 850° F., and is ready for delivery to the Pavonia station.

The 1,000-gal. pump takes care of cooling engines and compressors. The water is taken out of the cold well and pumped through the water jackets of engines and compressor and returns without going over the spray tower to the hot well section of the reservoir. Here it is picked up by the 1,500-gal. pump which furnishes water for the two sections of the towers (356 spray nozzles located on tower). Some of these spray nozzles are located in the section for gas cooling, the rest are in the other

(Continued on page 78)

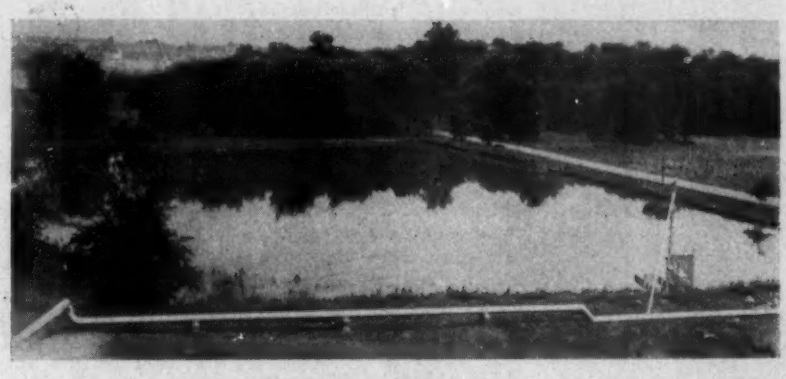


Fig. 5—Pond of the cooling tower

The small building of 10 and 22-ft. floor space above this extension houses four of the turbine pumps.

The concrete reservoir beneath the cooling tower is divided in the middle, one-half being a cold-water sump and the other the hot well. In the foreground of Fig. 3 the motors and discharge heads of the two 1,000-gal. pumps are seen placed above the cold-water sump, while the two 1,500-gal. pumps in the background are over the hot well.

The tower itself is divided into two separate compartments, each compartment having a large circulating fan set in the roof. One compartment contains the cooling coils for the inter and after coolers from the compressors. The warm water from this compartment is collected in the hot well which also receives the warm water from the engine and compressor jackets. The other compartment collects cool water for use in the cold well.

As will be noted, the position of the levers on the first and last pumps indicate that the valves are open and, therefore, these two pumps are in operation. The middle pumps are

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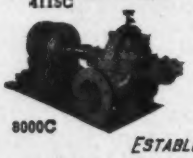

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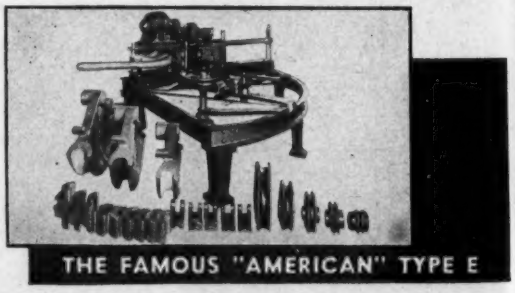

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QUESTIONS on TECHNOLOGY

by W. L. Nelson
Consulting Engineer

Isopropyl Alcohol Manufacture

When was isopropyl first manufactured from petroleum?—F.C.E.

Complete historical information is seldom available on such operations because many ventures are not commercially successful or do not appear in the news. However, according to Carleton Ellis (Chemistry of Petroleum Derivatives, Vol. I, page 349, Chemical Catalog Co., N. Y., 1934), Melco Chemical Co. in 1918-1919 built a pilot plant (News item, current events in the chemical and metallurgical industries, Chem. Met. Eng. 23, p. 231, December 22, 1920) near the Bayonne plant of Tide Water Oil Co. Later Standard Oil Co. of New Jersey secured rights to the process and by December 1920 were manufacturing isoprophyl alcohol at its Bayway refinery. Ellis also states on page 359 that the production was:

1922	37,500 gal.
1931	1,500,000 gal.

During this period, B. T. Brooks (Synthetic Alcohols and Related Products from Petroleum, Ind. Eng. Chem. 27, 279, 1935) reports that Petroleum Chemical Corp. erected a plant at Tiverton, R. I., in 1925-1926 for the production of isopropyl and other alcohols but that it was shut down after only 6 months of operation. However, Ellis in Vol. II of his Chemistry of Petroleum Derivatives (Reinhold Publishing Corp., 1937) states that this plant as well as one at Barnsdall, Okla., operated until 1932 when their interests were merged (probably with those of Standard Oil Co. of New Jersey).

O. D. Optical Density Color

In the March 22, 1947, Refining Issue, the optical density color scale is mentioned in your description of the propane deasphalting process. What is the o.d. color?—A.J.N.

This color scale was devised (Weir, Houghton, and Majewski, Control of Color of Petroleum Oils by Acid Treatment, Ref. Nat. Gaso. Mfg., December 1930, p. 89) in such a way that the color is directly proportional to depth of shade or color. Obviously, it is convenient in studying the efficiency of lubricating-oil treatments. It may be used to compare crude oils or apparently black cylinder stocks for the degree of blackness. It thus indicates the power of such materials to spoil the color of distillates by entrainment of black materials. In connection with chemical treatment it is particularly useful because a 2,000 optical density color is twice as dark as one of 1,000 o.d. color. Finally, it allows the color scale to be rationally extended or extrapolated into ranges of color that are too dark for ordinary scales (even diluted), by diluting with a colorless material. The relation between N.P.A. and o.d. color is:

$$\text{N.P.A.} = 1.08\,(\text{o.d.})^{0.32}$$

The o.d. scale was used (Anon., Prevention of Entrainment in Tube Still Processing, Ref. Nat. Gaso. Mfr, February 1934, p. 70) in studies of an entrainment separator known as the Centrifix.

Corrosion in Topping Tower

We are experiencing corrosion in the top section of our No. 1 crude tower of a U.O.P. two-tower type having a heater and reboiler coil in the unit furnace. We are processing Oklahoma City, West Edmond, and local crudes which contain salts ranging up to 150 lb. per 1,000 bbl. Ammonia is being introduced into the vapor line. We are considering lining the top section of this tower and would like a recommendation as to a suitable lining material and a list of references in which I could find specific corrosion rates of various metals and alloys under such or similar conditions?—J. G. K.

References to this type of corrosion are rare because scarcely any difficulty is encountered. Everyone uses salt settlers and hence can eliminate the combination of sulfide and acid corrosion which is bothering this operator. Refiner's Notebook No. 22, The Oil and Gas Journal, December 16, 1944, page 107, summarizes the types of alloys used throughout topping and cracking systems which must operate on sour crude oils. Ten recent references are also given but only one of them refers to difficulty with corrosion in the top of skimming towers. The large company that experienced the difficulty resorted to the use of a monel metal top and rundown lines. Ordinarily the cost of such a material would be considered as exorbitant. Undoubtedly 18-8 chromium nickel iron would also be satisfactory, but it, too, is expensive. Inexpensive alloys have not been successful for such services.

Mol Weight From Gravity And Distillation

I would like information on how to obtain the average molecular weight of a petroleum fraction, knowing the A.S.T.M. distillation and the gravity. The stock is a mixture of virgin light gas oil and propane deasphalted gas oil having a gravity of 26.2° A.P.I. and the following distillation characteristics:

I.b.p.	**438° F.**
10 per cent evap.	**515° F.**
30 per cent evap.	**597° F.**
50 per cent evap.	**680° F.**
63 per cent evap.	**700° F.**

F. E. J.

Of course, the exact way to obtain molecular weight is by freezing-point determinations at different concentrations so that a line can be drawn and extrapolated to zero solvent concentration to eliminate any effect of the solvent. In practice, however, charts and tabulations are widely used for estimating molecular weights for engineering design computations or estimates.

One of the most widely used methods involves the so-called characterization factor which is defined as the cube root of the average boiling point (°F. absolute) divided by the specific gravity at 60° F. This factor takes into account the particular kinds of molecules or hydrocarbons present in the material. Once the characterization factor has been determined the molecular weight can be read from charts that are published in many books, articles, etc.

With respect to the particular material mentioned in the question, it has an average liquid - volume - per cent boiling point of about 680° F. and a distillation slope of about 4.1° per each "per cent distilled." The molal average boiling point can be estimated from these two properties. It is about 50° lower than the liquid volume temperature, or 680-50 equals 630° F. (The Oil and Gas Journal, Molal Average Boiling Point, November 1, 1947, page 84; or Refiner's Notebook No. 47, Vapor Volume and Mol Weight, June 23, 1945, page 58). The characterization factor for a 26.2° A.P.I. (0.8973 specific gravity), 680 boiling-point stock is:

$$\sqrt[3]{680 + 460} / 0.8973 = 11.64$$

Space is not available here to show molecular weight, etc. charts. They are published in many books, etc. including Petroleum Refinery Engineering, Second Edition, page 103, McGraw-Hill Book Co., Inc., New York, 1941. An 11.64 factor, 630 molal boiling-point material will have a molecular weight of about 275.

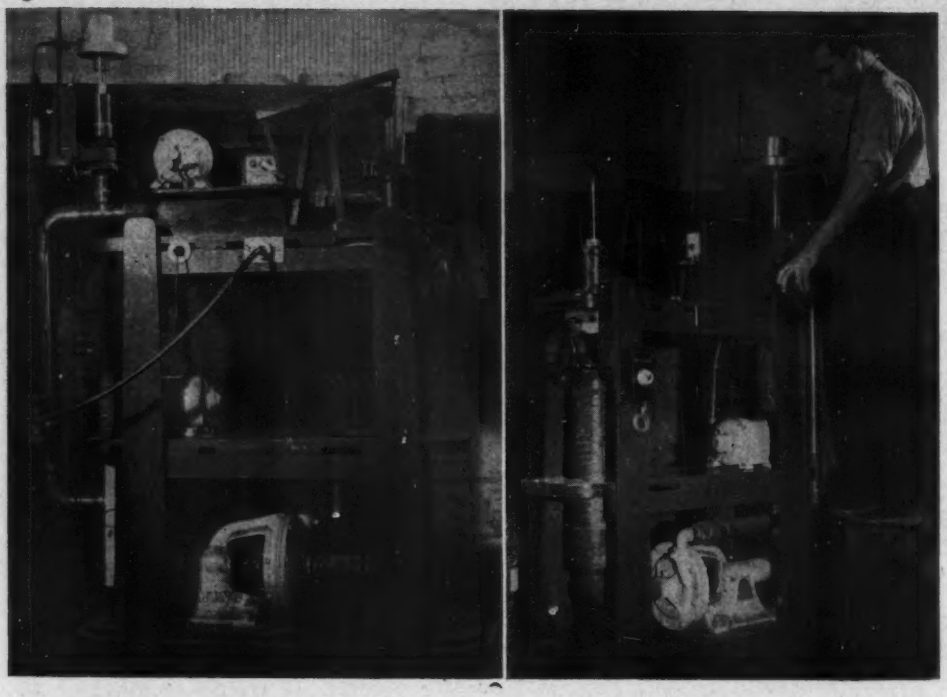


Fig. 1—(Left) Side view of the new laboratory mud apparatus, or "recirculator." Fig. 2—(Right) Operator in position to take viscosity readings

by
Norman E. Martello*

New Method for Evaluating Effect of Chemical Treatment on Drilling Mud

Here are described the construction and operation of a laboratory pilot unit for testing the effect of chemical treatment on drilling muds. Tests conducted with this recirculating apparatus embody the features of circulation and heating which are present in every field operation. Test periods can be made long enough under conditions approximating field operations so that a good comparison can be obtained between a specific chemical treatment in the laboratory and an actual drilling operation. By means of this pilot unit it is practical, therefore, to check various chemical treatments in the laboratory and obtain results which make it possible to know beforehand how a given treatment will work in the field.

ALTHOUGH the art of chemically treating drilling mud for viscosity reduction has been practiced for several decades, the laboratory testing methods which are still relied upon for evaluating the effects of various chemicals are quite similar to those used when the art was first initiated.

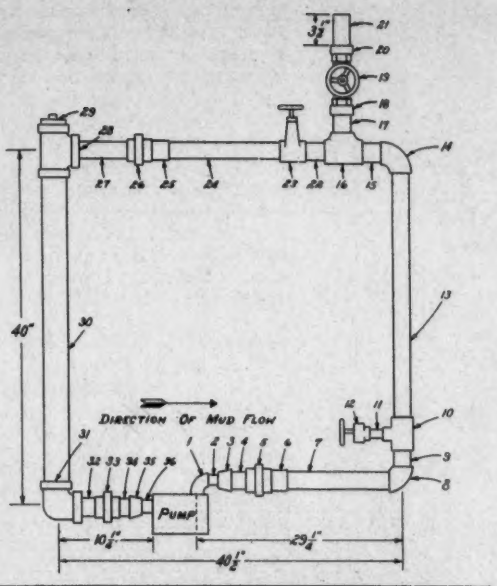
The literature is replete with information concerning the use of new instruments for evaluating the properties of mud, but very little has been written about the methods of processing the mud in the laboratory prior to testing. In general, the procedure consists of taking a known amount of mud, treating it with chemical agents, and determining with the aid of testing equipment the effect of these agents. In many cases the muds are treated and tested at room temperature; in others, the muds are treated and heated in sealed containers for periods of time prior to testing at room temperature. These methods, although of value in obtaining a relative picture of the mud behavior while it is quiescent, overlook the fact that in well drilling the mud is being agitated and heated concurrently for considerable periods of time. Changes in the clays and the ordinary treating chemicals by complex reactions involving base exchange, hydration or dehydration, adsorption or desorption are thus accelerated in well drilling, giving in many instances, results which differ from those shown by the clays and chemicals under ordinary static testing.

To approximate more closely the behavior of mud in actual field operations, an apparatus (see Fig. 1) has been devised and built in which the mud can be heated and circulated continuously for extended periods of time. Chemicals can be added to the mud while it is circulating and their effect on the mud can be studied in about the same way as in actual field practice. Viscosity can also be checked periodically without the necessity of removing mud from the apparatus.

Laboratory Tests and Field Operations

Two differences exist between this laboratory system and the systems used in field operations. In field work a reservoir of mud is always kept on hand to maintain the circulation of mud if some of it is lost to the formation penetrated; to permit settling of the sand carried to the surface from the bore hole; and to allow for any contingencies where an extra quantity of mud may be needed. No reservoir was incorporated in the laboratory system because of the possibility of channeling, which would lead to unequal treatment and incomplete circulation of the mud stream. Also, since the laboratory apparatus is a completely enclosed system, a reservoir of mud was not considered necessary for evaluating the effect of chemical treatment. Generally, a certain amount of contamination is introduced from the formations penetrated by the

*Research engineer, Calgon, Inc., Pittsburgh.



List Of Parts					
1	1" Service Elbow	13	2" Streamline Pipe	25	2" Copper To Iron Pipe Male Adp.
2	1" All Thread Nipple	14	2" Streamline 90° Elbow	26	2" Ball Joint Union
3	2"x1" Reducing Coupling	15	2" Streamline Nipple	27	2" Nipple Approx. 5½"
4	2" All Thread Nipple	16	2"x2"x2" Streamline Tee	28	3"x3"x2" Tee
5	2" Ball Joint Union	17	2" Streamline Nipple	29	3" Plug
6	2" Copper To Iron Pipe Male Adp.	18	2" Copper To Iron Pipe Male Adp.	30	3" Copper Pipe
7	2" Streamline Pipe	19	2" Powell New Ready Valve	31	3"x2" 90° Reducing Elbow
8	2" Streamline 90° Elbow	20	2" Copper To Iron Pipe Male Adp.	32	2" All Thread Nipple
9	2" Streamline Nipple	21	2" Streamline Nipple	33	2" Ball Joint Union
10	2"x2"x1" Streamline Tee	22	2" Streamline Nipple	34	2" All Thread Nipple
11	1" Streamline Nipple	23	2" "Z" Scott 125 Gate Valve	35	2" x 1½" Reducing Coupling
12	1" Scott 125 Gate Valve	24	2" Streamline Copper Pipe	36	1½" All Thread Nipple

Fig. 3—Pipe circuit arrangement and equipment list

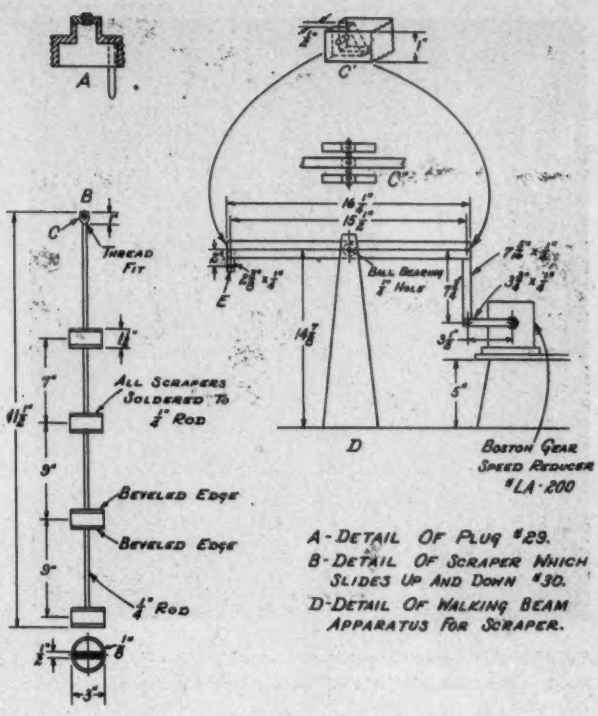


Fig. 4—Layout of scraper and walking beam drive

drill bit. This contamination varies considerably from well to well and from formation to formation in any given well. In the laboratory pilot unit, all of the contaminating materials are added to the original mud used in the test work. Satisfactory comparison of the effect of two chemicals on a contaminated mud can be obtained by adding the contaminant at the start of the test instead of a little at a time throughout the test.

The apparatus, which is designated as a recirculator, consists of three principal sections: a large centrifugal pump for circulating the mud, a heated section through which the mud flows, and a valve arrangement for trapping a mud sample so that the viscosity can be determined. The whole mud system is made of copper and brass, minimizing the corrosion which would result with the use of iron. Difficulties due to the sticking of hot mud on the inside of the heated pipe are eliminated by the up and down movement of a scraper which traverses the whole heated section. Capacity of the system is about 2.6 gal. and the mud is circulated at an approximate rate of 20 g.p.m.

For measurement of the mud viscosity (see Fig. 2), a Model LV Brookfield viscosimeter equipped with a variable speed drive is employed. Spindle rotation rates of 6, 12, 30, and 60 r.p.m. can be obtained by turning a switching device. The instrument is operated with a synchronous motor and comes completely standardized. It has a 1½-in. guard around the spindle which gives sufficient clearance for immersing into the mud cup. The No. 3 spindle rotating at 12 r.p.m. was used for obtaining all viscosity measurements recorded in this investigation.

Construction Details

A schematic sketch of the piping arrangement is shown in Fig. 3. In operation, a sample of mud is withdrawn at the beginning and the end of the test through the gate valve (12). Above the quick-acting valve (19) is an adaptor (20) and a nipple (21) both of which go to make up the cup in which the mud is retained while its viscosity is being determined.

A standard gate valve (23) is used for throttling the mud flow. The top outlet of the tee (28) is closed by a plug (29) through which the scraper rod slides, while the bottom outlet is joined to the heated pipe (30).

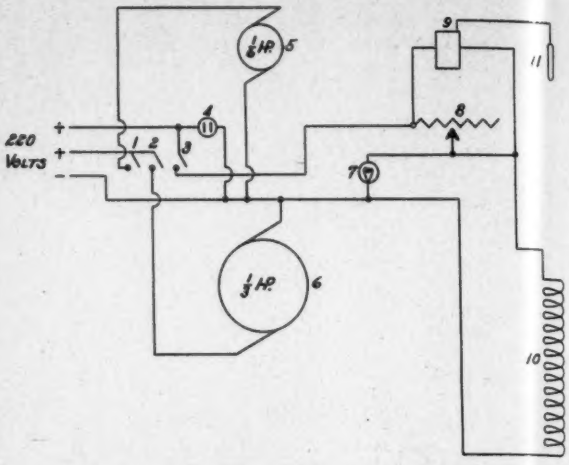
For ease in cleaning, the circuit is taken apart by unscrewing the unions (5) and (26). The one whole section of piping can then be removed and flushed out with water. By unscrewing the plug (29) and removing the scraper, the heated section (30) can be cleaned by brushing and flushing with water.

The second schematic sketch, Fig. 4, shows details of the scraper unit while Fig. 5 shows a closeup photograph of the scraper-assembly actuating mechanism. For assembling the scraper in the apparatus, the section (B) is slid into the pipe section (30). The coupling (C) is removed and the plug (A) is inserted on the rod of the scraper. The coupling (C) is then screwed on the scraper rod and attached to the end (E) of the walking-beam assembly by a bolt. The plug (A) is screwed into the tee (28) and the unit is now ready to operate.

The electrical wiring diagram of the apparatus is shown in Fig. 6. This drawing shows three switches: one for the pump motor (6), another for the walking-beam motor (5), and a third for the heater (10). Control of the heat input is accomplished by adjusting the thermoregulator (9) and the rheostat (8). Once the thermoregulator (9) has been set, control within ½° can be held by slight adjustments of the rheostat (8).

Prior to the start of a test, the apparatus is thoroughly cleaned and assembled, with the exception of the scraper and plug (A) over the heated pipe. A weighed quantity of mud then is poured into the recirculator through the top of the heated pipe. The total quantity of mud necessary to completely fill the apparatus varies with the mud weight, but generally amounts to about 12.8 kg. or 28 lb. With the apparatus filled, the scraper is inserted into the heated pipe and the plug is screwed over the top. The scraper is connected to the walking beam by the coupling (C); the thermoregulator and thermometer are placed in wells located on the plug; and circulation with heating and scraping is started.

After the mud temperature has risen to 176° F., viscosity measure-



No.	List Of Parts
1	Switch For ⅙ HP. Motor
2	Switch For ⅓ HP. Motor
3	Switch For Heater, Rheostat, And Pilot Lamp
4	Female Plug For Brookfield Viscosimeter
5	Motor For Operating Scraper Arrangement
6	Motor For Operating Pump
7	Pilot Lamp For Heater
8	Rheostat For Controlling Current To Heater
9	Thermoregulator For Controlling Temperature
10	Heater Around Copper Pipe #30
11	Thermoregulator Bulb For Temperature Control

Fig. 5—(Left) Closeup of the scraper assembly actuating mechanism.
Fig. 6—(Right) Electrical-wiring diagram for the mud-test equipment

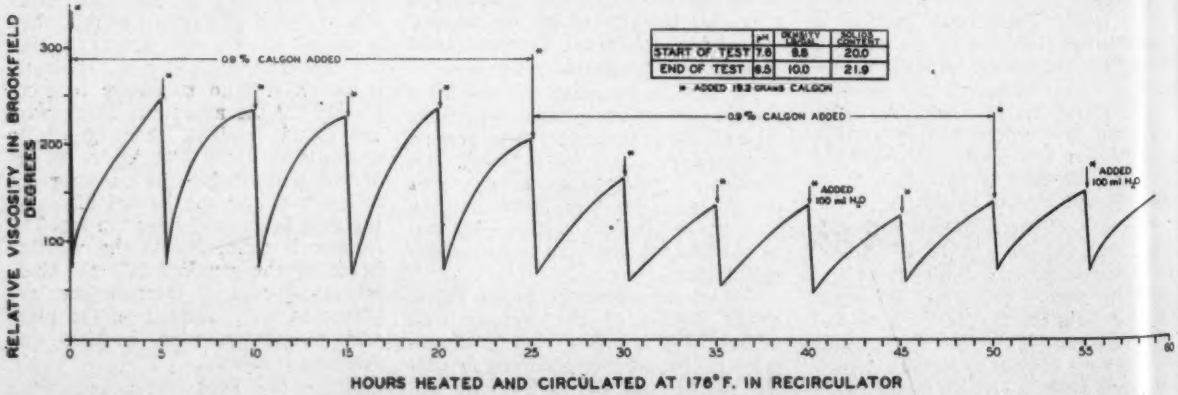
ments are obtained by the following method: With the valve (19) open, the valve (23) is slowly closed. The mud flow is throttled and the mud rises into the cup above the valve (19). When the mud is within an inch of the top of the cup, the quick acting valve (19) is closed and the rotating spindle of the Brookfield viscosimeter is immersed to the proper level in the mud. Viscosity readings are taken and recorded. The valve (23) and then the valve (19) are completely opened. This permits the mud to flow back into the recirculating system, after which the valve (19) is closed. The cup and viscosimeter are cleaned and are ready for reuse. A small mud sample is now removed through the valve (12) and retained for comparison with a sample to be taken at the end of the test.

Chemical treatment is now ready to be started, so the scraper is stopped in the up position and the plug (A) is unscrewed and lifted from the top of the heated pipe. The weighed chemical in a dry form is introduced into the circulating mud, followed by about 100 ml. water for rinsing out the chemical container. The plug is replaced on the heated pipe and the scraper is again started. After a 5-minute period, viscosity readings are again taken using the procedure described above.

Readings for Mud Viscosity

Circulation and heating of the mud are continued with viscosity readings being taken ½ hour after chemical addition and at 1 hour intervals thereafter up to 5 hours. Chemical is again fed in the same manner as described above, and viscosity readings are taken at ¼, ½, and 1-hour intervals after the feeding of reagent. These 5-hour cycles are carried on throughout the test, which may last for at least several days if the chemical used continues to treat the mud satisfactorily. If this is not the case, the mud will thicken up to such a point that the test must be stopped. Good comparisons of the practical life of various chemical treatments can thus be obtained. This time cycle was adopted because the mud thickened up sufficiently in 5 hours to make the feeding of chemical desirable.

Several times during each test 100-ml. portions of water are added to help make up for the loss due to evaporation from around the scraper rod. These water additions have very little effect on lowering the viscosity of the mud. At the end of the test a sample of mud is again withdrawn through the valve (12) and saved. Both mud samples, one from the beginning and the other from the end of the test are checked for pH, mud weight, and solids content. In this way the changes in these mud properties can be followed. It is obvious that this pilot unit permits considerable latitude in the method of testing, particularly with respect to the mud



	pH	Relative Viscosity	Solids Content
START OF TEST	7.6	8.8	20.0
END OF TEST	8.5	10.0	21.9

* ADDED 19.2 GRAMS CALGON

Fig. 7—Effect of Calgon on a salt-cut mud in a recirculator test

temperature employed and the frequency of chemical additions. Also, by means of the four-speed arrangement on the Brookfield viscosimeter, apparent viscosities may be determined at any one of the four rates of shear. With this viscosimeter it is possible to follow the rate of gel of the mud by taking readings with every revolution of the spindle over a short time period. This can only be done at 6 and 12 r.p.m., since at the higher rotation rates, continuous readings cannot be taken while the spindle is in motion.

Fig. 7 shows a plot of the values obtained by treating 12,800 g. of a mixed mud composed of 0.5 per cent bentonite, 9.5 per cent ordinary drilling mud clay, 9.5 per cent barite, and 0.35 per cent sodium chloride with Calgon* over the entire testing period. The concentrations of all ingredients were based on the total mud weight. The pH was 7.6 at the start of the test and 6.5 at the end. No alkali agent was added during testing. The drop in pH was presumably due to partial rehydration of the Calgon or to sequestration of calcium ions from the water and clay. Both the density and the solids content increased a little from start to finish, the density rising from 9.8 to 10.0 lb. per gal., with the solids increasing from 20.0 to 21.9 per cent. These values indicate that the mud lost water by evaporation during the 59-hour test period.

The initial addition of 19.2 g. of Calgon, which is equivalent to 0.15 per cent of the total mud weight, markedly decreased the viscosity of the original mud. As heating and circulation were continued, the mud thickened up. After 5 hours, a second increment of Calgon again reduced the viscosity, which subsequently rose again as heating and circulation were continued. After a total of about 1.0 per cent of Calgon had been added, the mud began to show progressively less increase in viscosity during the successive 5-hour periods. Even after 2 per cent of Calgon had been added, the increase in viscosity during each cycle was small indicating that considerably more chemical could have been added before the original viscosity conditions would be reached.

*A soluble complex sodium phosphate glass with a guaranteed minimum content of 67 per cent P_2O_5 and impurities including water of less than 0.25 per cent when made.

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BOOKS

OUR INDUSTRY—Anglo-Iranian Oil Co., Ltd. Published by Britannic House, Finsbury Circus, London E.C. 2, England. 304 pp.

This volume is subtitled "an introduction to the petroleum industry for the use of members of the company's staff," and that, briefly, is just what the book is. It is so written that it gives a general description of the industry, so that a man engaged in one phase of the activities of Anglo-Iranian will know the structure of the organization and see how and where his branch of work fits into the general scheme.

Chapters include descriptions of the discovery and production of oil, refining and the manufacture of finished petroleum products, bulk transportation, distribution, petroleum as a source of power, lubrication, lubricants, the use of oil and fuel, other products obtained from petroleum, the role of research in the industry, the significance of laboratory tests, the structure of the industry, glossary of terms, and statistics and data. The volume is liberally illustrated with maps, photographs, flow diagrams, and charts, as well as tables.

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"AMERICAN" PARAFFIN BIT
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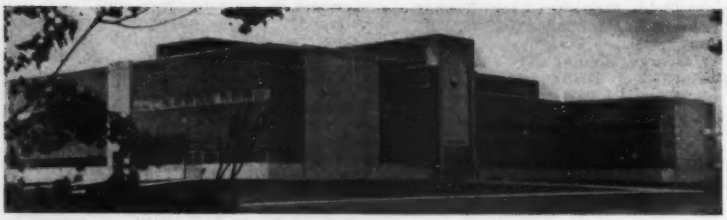
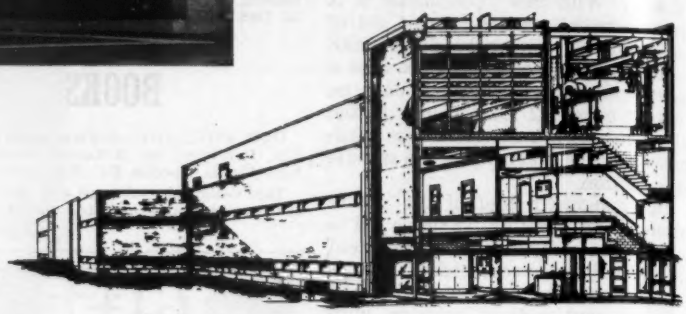


Left: In this million-dollar-plus three-story laboratory at Houston, Shell Oil Co., Inc., will work on new and improved methods for finding and producing oil and gas. Below: Cross-section showing the modern design and construction details incorporated in the laboratory



SHELL'S NEW LABORATORY *for* Exploration and Production Research

by Dahl M. Duff

A NUMBER of unusual features designed to provide maximum utility for petroleum research work have been incorporated in the construction of the new exploration and production research laboratory of Shell Oil Co., Inc. The three-story soundproof, air-conditioned brick building, which was formally dedicated in ceremonies last month, is located on Bellaire Boulevard in Houston. It was built by The Austin Co. and contains a total of nearly 45,000 sq. ft. of floor space. Work was begun in March 1946 and construction cost was considerably above $1,000,000.

Completion of the new laboratory will allow a gradual but substantial expansion in Shell's research activities in the exploration and production fields. When the staff is brought to full strength, approximately 175 scientists, technicians, and assisting personnel will be at work in the laboratory.

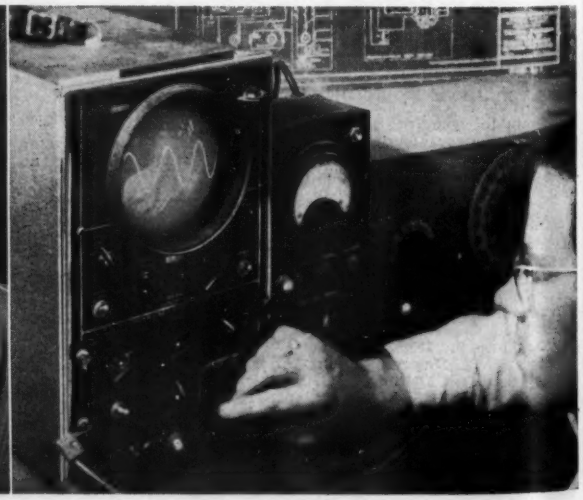
Adjacent to the new laboratory building on the south is the Shell laboratory built in 1936 and largely used for geophysical research since that time. In the future it will be devoted to the manufacture of geophysical equipment and apparatus which may be developed in the new laboratory.

Approximately 20,000 sq. ft. of floor space, including more than 100 separate working areas, is contained on each of the first two floors of the new building. The third floor with 4,760 sq. ft. floor space is entirely taken by an array of equipment for building services, such as air conditioning, electrical dust precipitation, and water distillation. The laboratory is constructed in the shape of an "H," with approximately 250 ft. frontal width. If expansion of the laboratory is desired in the future, the design allows the addition of another U-shaped building in the rear.

Interior Design of Laboratories

To give flexibility in use of laboratory space, interior design has been centered around the standard laboratory unit known as the "SLU." Each SLU consists of a laboratory room of about 450 sq. ft. floor space and two smaller rooms of 118 sq. ft. floor space each, one a calculation room and the

Left: Operator at a new thermal analysis unit in one of the physical-research lab units. Right: Here a study of wave form of a special impedence bridge is made in the ultra-high-frequency laboratory section



other for the senior staff member.

In addition to the 17 three-room laboratory units and several general laboratories, there are a large machine shop with more than $100,000 worth of precision machine tools to provide equipment for the staff, a glass-blowing department, a paneled library with shelf space for 10,000 volumes, a conference room with movie-projection facilities seating up to 75, a 125-seat cafeteria with modern kitchen, five individual dark rooms, plus large central photographic and reproduction departments.

The normal hazards of petroleum laboratory operations have been eliminated by unusual safety precautions. Shatterproof safety glass has been used throughout all interior partitions and doors, and push-button emergency shutoff controls for all the building services, as well as self-starting safety showers, have been located at strategic points throughout the laboratory suites and building corridors.

The utility services required for laboratory operation, including power, air, gas, steam, hot and cold water, distilled water, vacuum, etc., are carried into the individual rooms from the area between the first floor ceiling and the second floor, where piping, wiring, etc., have all been concentrated in 4-ft. galleries for ease of access in the face of ever-changing laboratory requirements. These services are run up—or down—to the working areas either through the floor or through the building columns, from which they can be extended around the perimeter of the rooms to serve any combination of equipment. Thus, space within the building columns is used as a wireway, as a pipe chase for the multiple laboratory services, and as exhaust ducts through which air is drawn off under suction.

Because of the many sensitive electrical instruments used by Shell in developing new techniques for locating and developing oil fields, special precautions were taken in the design of power distribution systems. For this reason, special concentric cable was used in the main feeder lines and other wiring was designed to prevent stray currents developing localized magnetic disturbances.

At four locations on the first floor, 3-ft. 8-in. concrete cubes reach through the floor and are placed in the clay-bonded-gravel building base. These give a vibration-free base for delicate seismometer work. The only connection with the floor is a dead copper strip; removable plates cover the gap around the cubes when they are not in use.

To provide a convenient method for hanging or anchoring heavy laboratory apparatus, a narrow slot extends from floor to ceiling at intervals around the laboratory walls. This slot in which equipment may be bolted is made in a specially designed extruded aluminum section on either side of which the tile walls are fitted.

Laboratory Organization

Head of the new laboratory is Dr. Harold Gershinowitz, director of the division of exploration and production research, who joined Shell in 1938 and who prior to 1945 was director of the company's manufacturing department in New York. The two associate directors are Dr. M. King Hubbard, for exploration, and J. P. Murphy, for production. Other top men include Dr. Noyes D. Smith, Jr., laboratory manager; W. L. McKinnon, office manager; and Howard E. McKinney, research engineer.

Shell has broken the laboratory organization down into branches devoted to the three major sciences—physics, chemistry, and geology—rather than to set up the more traditional organization of exploratory and production departments.

The new Shell laboratory will take over research work that heretofore has been carried on in scattered locations throughout the country. Research in refinery problems, chemical synthesis, and production application will continue to be carried on at other Shell laboratories and at Shell Development Corp.'s Emeryville, Calif., laboratories. Emeryville will continue to handle Shell's corrosion research since most work of this nature has been in progress there.

Fields of Research

One major phase of work at the laboratory will be directed toward improvement of present methods of geophysical exploration. Much of this will naturally fall to the physical department. To further this work, the laboratory has an experimental land seismic party and a marine seismic party with three boats for overwater research. These latter at the present time consist of one 104-ft. and two 85-ft. boats fitted with geophysical equipment, some of which is experimental.

This program includes investigation of the entire field of elastic waves in the earth. Present techniques will be examined, but at the same time an entirely new approach to the problem of seismic exploration will be sought.

Another field of study at the laboratory will be reservoir characteristics. Equipment for research into fluid flow in porous media has been provided. Other studies of a primarily physical nature will be made into well logging and well measurements.

Among the problems to be handled largely by the chemical department are studies of clay minerals,

Left: The Shell research people state "measuring the thickness of a cat's whisker would be child's play for the high precision instruments used in oil exploration." At any rate, here a Shell technician winds coils for seismic instrument that measures motions no greater than the diameter of a water molecule. Right: Research plans, projects, and results are discussed in this conference room—a central part in the new Shell lab

characteristics of source beds, well treatment, and drilling fluids. One section will be interested in thermodynamics and the properties of reservoir fluids. In the geological department, methods of correlation will be investigated not so much for correlation itself but rather to improve existing techniques. Geologists will also study general problems in stratigraphic and structural geology.

Operations of the three departments are expected to be interrelated throughout. One example is the analysis section of the chemical department where work crosses both chemical and physical lines.

The analytical work is subdivided into a wet-analysis section and a spectrographic laboratory. Wet-analysis equipment includes facilities for classical chemical analyses of all kinds. This laboratory also has a polarograph, refractometer, electro-analyzer, and equipment for oxidation-reduction titration, conductivity and viscosity measurement, and microscopic and microchemical work.

Cementing Casing

(Continued from page 57)

6 ft. apart in those installations, and centralizers were rarely used with the scratchers. More recent practice is to space both scratchers and centralizers over the entire length of casing from the shoe to a point well above the top of the uppermost possible pay zone. Spacing between scratchers is usually somewhat wider than that formerly used, most commonly 10 to 15 ft., and is governed somewhat by the vertical distance the operator is willing to reciprocate the pipe during cementing operations. The pipe should be reciprocated a minimum of 5 ft. more than the spacing between the scratchers to insure adequate wall-cake removal.

While an improvement in the cement seal over that provided by cementing with bare pipe was obtained by the older method of scratcher placement, cementing failures were still frequent. It readily can be seen that the chances of a cement failure will be reduced by running scratchers over the entire length of casing from the shoe to some point above the uppermost zone of possible production. If no scratchers are run on the lower portion of the casing string, and channeling develops in that section of the annulus, any change in the course of the channels, while cement is going around the shoe, will contaminate the cement column with drilling fluid, thereby providing a potential flaw in the cement through which it may be possible for well fluids to communicate after completion of the well. It is also evident that if the cement column moving upward is distributed uniformly around the casing in the lower section of the well bore, the chance of uniform distribution up the hole is much better than if channeling occurs in the lower part of the annulus.

Scratchers Not Welded

Fig. 1 shows a commonly used plan for spacing scratchers and centralizers on casing. This is the spacing plan that was used on the casing in each of the wells discussed later in this paper, and is the plan that is used, with minor variations, but many other operators on the Gulf Coast. The scratchers are not welded in place, but are free to slide on the casing. The distance the scratchers can travel is limited to 18 in. by spacer lugs spot welded at three points around the casing both above and below each scratcher. This permits the pipe to be picked up enough to clear the slips without moving the scratchers upward while running the casing in the hole.

Centralizers are usually welded to the casing, but their design is such that the centralizer spring will retract to permit passage through hole restrictions of considerably less size than normal centralizer diameter. One new-type centralizer recently introduced is not welded to the casing, but is designed to slide a limited distance along the casing in somewhat the same manner as the scratchers. This type is hinged for rapid installation, and may be installed over a collar while running casing, if desired, using the collar in lieu of lugs welded to casing to limit the centralizer travel.

Referring to Fig. 1 again, it will be noted that two scratchers are placed 18 in. apart in the 3 ft. immediately above the casing shoe. A centralizer is placed immediately above the second scratcher, then scratchers at approximately 8-ft. intervals over the remainder of the shoe joint. Object of the close spacing over the shoe joint is to aid in distributing the cement evenly around the casing as soon as possible after the cement passes around the shoe. The second centralizer is placed 45 ft. above the first one, followed by three scratchers 15 ft. apart, and a third centralizer 45 ft. above the second. Thereafter scratchers are spaced 15 ft. apart, and centralizers 90 ft. apart, over the remainder of the portion of the casing string equipped with scratchers.

Centralizer Spacing

A centralizer is usually placed above the top scratcher to provide protection for the upper scratchers while running the casing in the hole. Centralizer spacing is closer over the lower section of the casing than up the hole, because a possible pay zone is nearly always in the interval covered by the bottom two joints of casing. When other pay zones are present up the hole, added centralizers are often also placed through those zones. Additional centralizing is desirable in such zones for additional insurance that cement will be uniformly distributed around the casing at all critical points.

Fig. 2 shows centralizer and scratcher spacing relative to the electric log in a well recently completed in South Louisiana. Thirty-three scratchers and seven centralizers were used over the bottom 450 ft. of casing in this well. Production perforations were placed 10,090 to 10,096 ft., just above the second centralizer from bottom. Although production was from a relatively thin oil column overlaying water in a field in which cement failures have been frequent, the well produced pipe-line oil upon completion without squeezing.

In March 1947, Barnsdall Oil Co. adopted the policy of equipping all strings of production casing in South Louisiana with centralizers and scratchers. Since that time, a total of 19 strings of casing so equipped have been run by Barnsdall in West Tepetate, Egan, and Longville fields in southwestern Louisiana. Seventeen of these strings of casing were run without difficulty. In each of these 17 cases, the casing was reciprocated during the entire cementing process, and the cementation was satisfactorily completed with the pipe set at the desired depth. The other two strings, both of which were in Longville field, stuck while running in the hole, one 131 ft. off bottom and the other 10 ft. off bottom. Whether or not the scratchers contributed to the sticking of these two strings of casing is problematical. In each instance hole conditions existed that are inducive to keyseating, and it is possible that the same difficulty would have been encountered had the casing not been equipped with scratchers. Usually no difficulty is experienced with the pipe sticking after it is once moving after circulation has been started.

Degree of freedom of a string of casing equipped with scratchers normally becomes greater the longer the pipe is reciprocated. After 10 or 15 minutes of reciprocation, the pipe usually works with a freedom seldom exhibited by bare pipe. It is not uncommon, with a casing string equipped with scratchers, for the weight indicator to show 50,000 lb. more weight when the casing is being raised than when the casing is being lowered when reciprocation is first started, and to show only 5,000 lb. more weight when the casing is being raised over the weight shown when the casing is being lowered after 10 minutes of reciprocation.

Special precautions should be taken to prevent the casing from sticking when running a string equipped with scratchers, particularly after the casing has been run to the desired depth, because at that time the casing and drilling crews are more inclined to be negligent. Even though the casing has been run to the depth required,

the value of the scratchers is lost if the casing cannot be reciprocated during cementation. The casing should be kept moving at all times when possible, and preparations for installing the cementing head should be made before the last joint is run, to keep the time the casing is setting on the slips, while installing the cementing head, at a minimum. When casing is to be cemented on bottom, it should be stopped several feet off bottom to install the cementing head and to break circulation before "feeling" for bottom.

No Precautionary Squeeze

The 17 wells in which the casing was properly reciprocated during cementing were all perforated for production without precautionary squeezes above and below the productive interval. Fifteen of these wells were successfully completed producing pipe-line oil, with reasonable gas-oil ratios, without further cementation. One of the other two wells produced gas through the initial perforations, and subsequently produced oil after squeezing off the first set of perforations and reperforating lower. It has been proved, however, that the gas produced through the initial perforations came from the formation directly opposite the production perforations. The other well, which was low on the flank of the structure, was perforated unusually close to the water-oil contact, and produced both water and oil on test. This was the only well of the 15 that might possibly have had a cement failure. Water was known to be so close to the perforations, however, that the scratchers could not be charged with a failure on this job.

During the 2 years preceding the time in which the work described above was performed, Barnsdall ran 31 strings of production casing in West Tepetate field. Precautionary squeezes were made above and below the zones to be tested in all but one of these wells. The well that was not squeezed prior to testing initially produced clean oil, but several months later bottom-hole-pressure performance indicated probable communication between the producing interval and another zone. Of the 30 wells squeezed previous to testing, 5 gave conclusive evidence of faulty cementation in the initial production tests, in spite of the precautionary squeezes. In each of the five cases, the wells were repaired by subsequent squeezing before moving the drilling tools off location.

Results of the work described above indicate a definite improvement in the degree of success of casing cementation in southwestern Louisiana when the casing is properly equipped with scratchers and centralizers. Similar results have been reported by other operators in other areas. The possibilities afforded by the use of centralizers and scratchers are just beginning to be fully recognized, and it is likely that the near future will reveal new developments in equipment, and in the technique of handling equipment, for improving casing cementation.

Acknowledgment

Appreciation is expressed to Barnsdall Oil Co. for permission to publish this article. Acknowledgment is made of the cooperation of A. E. Hoffman, K. W. Haley, H. F. Beardmore and other members of the production and engineering department of Barnsdall Oil Co. in conducting this work.

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The Role of Dispersants

(Continued from page 59)

gasoline, gave a lacquer rating 2.2 to 2.4 units lower than fuel A, which consisted of straightrun components normally used in aviation gasoline, when both were run with the same lubricant.

2. Composition of lubricating oil.— Basic oxidation stability and inhibitor susceptibility of an oil are determined by the composition of the oil. The presence of comparatively low concentrations of certain impurities is highly detrimental in this regard. Composition of the oil also determines to a large degree the type of oxidation product formed. Oils high in aromatics and sulfur form more insoluble oxidation products. This is particularly true of highly polar aromatics having a condensed ring structure, in contrast to the less polar aromatics remaining in an oil after solvent extraction. It has been shown elsewhere[10] that the tendency of a California distillate to produce asphaltenes upon oxidation decreases markedly with increasing degrees of extraction.

More direct evidence with respect to the effect of aromatics on lacquer formation is shown in Fig. 2, where lacquer rating is plotted against per cent of unextracted oil in a blend with a Duo-Sol extracted stock. These two components had specific dispersion values of 143.9 and 107.3, and VI values of 41 and 97, respectively. It will be observed that the presence of a comparatively low concentration of the unextracted stock in the blend had a profound effect on lacquering tendency, both in the Lauson and Chevrolet engine. This effect cannot be explained by differences in overall stability, and must be attributed to differences in the nature of the oxidation products.

Another example is the relative behavior of white oil and the S.A.E. 10 oil, shown in Table 3, in the Lauson test with a straightrun gasoline as fuel. The former gives a lacquer rating of 10 to 9, and the latter about 5; although the former is by far the less stable of the two it produces much less lacquer, for its oxidation products, which are nonaromatic, are almost completely soluble or volatile, while an appreciable portion of oxidation products of the latter are insoluble.

Various additives affect the formation of oil insolubles; some are beneficial in this respect and others are detrimental. Antioxidants and anticatalysts (deactivators and passivators) decrease the rate of formation of oil insolubles through their effect upon over-all rate of oxidation.

Certain additives, however, form oil-insoluble deterioration products, and thus contribute directly toward the formation of potential lacquer, even though they may inhibit oxidation of the oil. Phenyl-alpha-naphthylamine is an example of this type of additive.

Although it appears offhand to be paradoxical, dispersants in general tend to increase the rate of formation of oil insolubles in an engine. This is due to their ability to keep engine surfaces clean and vulnerable to attack by acidic oxidation products, thus enhancing metal catalysis. As far as lacquer formation is concerned this effect is, of course, more than offset by the beneficial effect of the dispersant in preventing deposition, as will be seen in the next section, but it does constitute a problem with respect to over-all oxidation and bearing corrosion.[10,11]

Conditions under which an engine is operated have a profound effect upon the rate of formation of oil insolubles, both from the oil and from the fuel. As mentioned previously, temperature is one of the most important conditions as far as effect upon the formation of deposits is concerned.

Effect of temperature upon the formation of oil insolubles from the oil can be explained by the well-known exponential relationship between temperature and rate of oxidation. From this standpoint low operating temperatures are desirable.

Influence of temperature upon the formation of oil-insolubles derived from the fuel is more complex. At low temperatures there may be more oxidation of fuel components to oil insolubles, since there is a higher concentration of fuel dilution present in the oil under low temperature conditions and since the fuel is normally much less resistant to oxidation than is the lubricant. At high temperatures the diluents in the lubricating oil are vaporized and removed from the crankcase.

It has been pointed out by Mougey[9] that heavy piston deposits are built up in the course of a 40-hour (Sched-

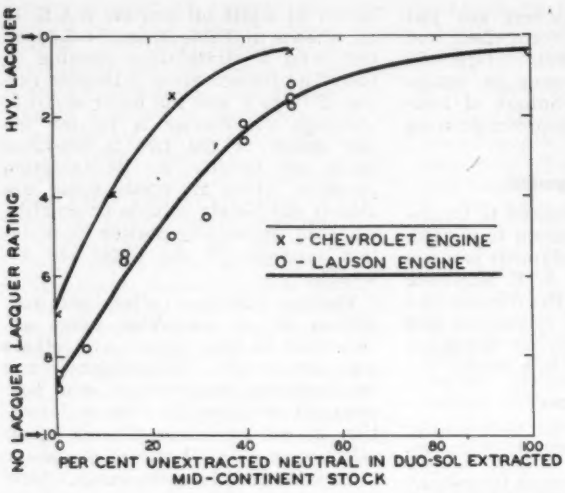

Fig. 2—Effect of oil composition on lacquer rating. Unleaded aviation gasoline used as fuel

ule B) test in which the jacket and oil temperatures are maintained at 94° and 154° F., respectively, when certain fuels are used in conjunction with either straight mineral oils or heavy-duty lubricants. One such fuel was shown to give excellent results when run with a heavy-duty oil in the L-4 test, which differs from the Schedule B test primarily in that much higher jacket and oil temperatures are used (200° and 265° F., respectively.)

The Texas Co., in its publication "Lubrication" for November 1945 has shown the effect of several factors upon the deposition of "low temperature sludge" upon piston skirts, oil rings, and the oil pan and cover plates. An increase in jacket temperature from 95° to 120° F. had a marked effect in reducing deposition, and a further increase to 180° F. had a further effect in the same direction. This, of course, constitutes a strong argument in favor of high-temperature thermostats in the cooling systems of engines. Marked reduction in deposition was also brought about by raising the intake manifold temperature from 95° to 190° F. Here, as in the case of jacket temperature, the increase in temperature probably reduced the quantity of fuel present in the liquid state, and hence resulted in less dilution of the oil, thereby decreasing the concentration of "potential deposits" in the oil.

Thus the optimum temperature in an engine, as far as obtaining freedom from lacquer and sludge deposits is concerned, is a matter of compromise. Too low a temperature results in excessive oxidation of the oil. However, since present oils are made to resist oxidation at fairly high temperatures, operation at moderately high temperatures is to be preferred.

Catalysis by engine metals, particularly copper and iron, and by "crankcase catalyst," which has as its main active ingredients iron halides formed from the engine metal and halogens occurring in tetraethyl lead fluid, is another important factor in determining the rate of formation of engine deposits.

Presence of water in the crankcase may have a pronounced effect upon rate of oxidation of the oil, although this factor does not appear to have received much study. Water is, however, known to have a marked effect upon the length of the induction period of a turbine oil in the turbine oil stability test,[12] which is run in the presence of metallic copper and iron. An oil which had an induction period of only 110 hours in the standard test with water present lasted for more than 400 hours in the absence of water. Similar results have been observed in an accelerated bomb test run in the presence of oxygen and the same two metals used in the above mentioned test. The presence of water decreased the "life" of various oils by a factor of 3 to 10. This effect is probably associated with metal catalysis.

Presence of water, like that of dilution, in an engine can be controlled through the control of temperature. Crankcase ventilation is another factor which influences the amount of water and dilution present. Without effective ventilation the advantages of optimum operating temperatures are not fully realized.

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Cooling-Water Requirements

(Continued from page 67)

section next to the pump house. The water which comes from the spray nozzles in this section simply goes over the decks of lath, etc. After falling into the reservoir, this water returns to the cold well and is used over again for supplying the water jackets with cool water.

In a cooling tower the spray and cooling action is affected by radiation from sides of tower, contact of water with cool air, evaporation, and the induced draft.

On top of the tower there are installed two fans, one 116-in. diameter and the other 132-in. diameter. The gas-cooling fan (116-in.) is connected by a jack shaft and reducing gears to a 15-hp. motor (when operating at 875 r.p.m., 3.7 hp. are required). The jacket-water cooling-fan (132-in. diameter) motor delivers 25 hp. at 1,750 r.p.m. and 6.2 at 875 r.p.m.

Two-speed fans were selected to provide induced draft as dependent on atmospheric conditions. In the winter the fans are not used very much, but during hot and humid summer days they are run continuously. The fans draw the air through the side louvers of the tower, accelerating the air current in the enclosed structure.

The river pump, previously mentioned, is located on the river bank ½ mile away from the gas station. It is installed in a concrete pit (see Fig. 4) and protected from the weather by a steel shed. Distance from the bottom of the discharge head to the bottom of the strainer is 10 ft. The discharge line is laid underground and supplies the pond of the cooling tower (see Fig. 5). Its operation is automatic and installation is frost proof.

The pond pump mentioned before is installed in a structure similar to the river pump. To keep it from freezing up in winter a heater is provided.

This pump operates during unfavorable hot-weather conditions for a period of 30 minutes twice daily, or pumping 15,000 gal. each 24 hours.

The Ashland station handles between 26 and 38 million cubic feet of gas per day, but removes no gasoline or water moisture—this is done at the Pavonia plant. When the gas reaches Pavonia it is stepped up by compression to 800 psi. for delivery to underground storage near markets, and at 350 psi. for delivery direct to market.

The Refiner's Notebook

A WEEKLY FEATURE OF THE OIL AND GAS JOURNAL

7—Pipe and Tubing Sizes (9—10¾ in.)

Nominal pipe size (in.)	Steel pipe: Schedule and name	Steel pipe: O.D. (in.)	Steel pipe: I.D. (in.)	Pressure tubing: O.D. (in.)	Pressure tubing: Thickness (in.)	Line pipe: O.D. (in.)	Line pipe: Thickness (in.)	Casing: O.D. (in.)	Casing: I.D. (in.)	Cast iron pit-cast: O.D. (in.)	Cast iron pit-cast: Grade	Cast iron pit-cast: I.D. (in.)
9	...	....	.....	9	¼	9	*0.250	9	8.608	....	..	....
	...	....	.....	9	½	9	*0.259	9	8.290	....	..	....
	...	....	.....	....	..	9	*0.2812	9	8.196	....	..	....
	...	....	.....	....	..	9	*0.284	9	8.150	....	..	....
	...	....	.....	....	..	9	*0.300	9	8.032	....	..	....
	...	....	.....	....	..	9	*0.3125	9	7.910	....	..	....
	...	....	.....	....	..	9	*0.355	9	7.812	....	..	....
	...	....	.....	....	..	9	*0.375	....	....	....	..	....
	...	....	.....	....	..	9	*0.402	....	....	....	..	....
	...	....	.....	....	..	9	*0.425	....	....	....	..	....
	...	....	.....	....	..	9	*0.484	....	....	....	..	....
	...	....	.....	....	..	9	*0.500	....	....	....	..	....
9⅝	...	....	.....	....	..	9⅝	*0.250	9⅝	8.921	....	..	....
	...	....	.....	....	..	9⅝	*0.259	9⅝	8.835	....	..	....
	...	....	.....	....	..	9⅝	*0.2812	9⅝	8.755	....	..	....
	...	....	.....	....	..	9⅝	*0.284	9⅝	8.681	....	..	....
	...	....	.....	....	..	9⅝	*0.300	9⅝	8.535	....	..	....
	...	....	.....	....	..	9⅝	*0.3125	9⅝	9.063	....	..	....
	...	....	.....	....	..	9⅝	*0.340	9⅝	9.001	....	..	....
	...	....	.....	....	..	9⅝	*0.342	9⅝	8.885	....	..	....
	...	....	.....	....	..	9⅝	*0.375	9⅝	8.799	....	..	....
	...	....	.....	....	..	9⅝	*0.4375	9⅝	8.435	....	..	....
	...	....	.....	....	..	9⅝	*0.500	....	....	....	..	....
10	20	10.75	10.250	10	¼	10	0.250	10	9.384	11.10	1	10.10
	30 standard	10.75	10.136	10	½	10	*0.259	10	9.582	11.10	2	10.02
	40 standard	10.75	10.020	....	..	10	*0.270	10	9.434	11.10	3	9.94
	60 extra strong	10.75	9.750	....	..	10	*0.2812	10	9.200	11.40	4	10.14
	80	10.75	9.564	....	..	10	*0.283	10	9.120	11.40	5	10.04
	100	10.75	9.314	....	..	10	*0.284	10	9.016	11.40	6	9.94
	120	10.75	9.064	....	..	10	*0.300	10	8.908	11.60	7	10.02
	140	10.75	8.750	....	..	10	*0.308	10	8.790	11.60	8	9.90
	160	10.75	8.500	....	..	10	0.3125	....	....	11.84	9	10.00
	...	....	.....	....	..	10	*0.340	....	....	....	..	....
	...	....	.....	....	..	10	*0.375	....	....	....	..	....
	...	....	.....	....	..	10	*0.4375	....	....	....	..	....
	...	....	.....	....	..	10	*0.500	....	....	....	..	....
10¾	...	....	.....	10¾	⅞	10¾	0.250	10¾	10.050	....	..	....
	...	....	.....	....	..	10¾	*0.259	10¾	9.950	....	..	....
	...	....	.....	....	..	10¾	0.279	10¾	9.850	....	..	....
	...	....	.....	....	..	10¾	*0.2812	10¾	9.784	....	..	....
	...	....	.....	....	..	10¾	*0.284	10¾	9.760	....	..	....
	...	....	.....	....	..	10¾	*0.300	10¾	10.192	....	..	....
	...	....	.....	....	..	10¾	*0.302	10¾	10.136	....	..	....
	...	....	.....	....	..	10¾	0.307	10¾	10.054	....	..	....
	...	....	.....	....	..	10¾	*0.3125	10¾	9.960	....	..	....
	...	....	.....	....	..	10¾	*0.348	10¾	9.960	....	..	....
	...	....	.....	....	..	10¾	0.365	....	....	....	..	....
	...	....	.....	....	..	10¾	*0.375	....	....	....	..	....
	...	....	.....	....	..	10¾	*0.395	....	....	....	..	....
	...	....	.....	....	..	10¾	*0.400	....	....	....	..	....
	...	....	.....	....	..	10¾	*0.424	....	....	....	..	....
	...	....	.....	....	..	10¾	*0.450	....	....	....	..	....
	...	....	.....	....	..	10¾	*0.483	....	....	....	..	....
	...	....	.....	....	..	10¾	*0.495	....	....	....	..	....
	...	....	.....	....	..	10¾	0.500	....	....	....	..	....

*These are special sizes. Notes—See Refiner's Notebook 173 (December 6) for specifications and references.

No. 178 in a series by W. L. Nelson, professor of petroleum refinery engineering, University of Tulsa

SUNRAY ANNOUNCES

their Duncan, Oklahoma plant remodelled and "on stream" 77 days after purchase.

SUNRAY'S DUNCAN PLANT ON STREAM

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MODERN Rotary DRILLING

Power Slush-Pump Characteristics

INHERENT characteristics of an internal-combustion engine mechanical-drive arrangement, in relation to hoisting and rotating operations of the rig, have been discussed previously in this series. The characteristics of such an arrangement are even more pronounced in case of power slush-pump drives. In case of hoisting and rotating, a multiple-speed transmission is interposed between the engine and the driven member. In contrast, the power slush pump usually is driven directly from the engine through a V-belt drive, so that the variation of the speed of the engine is the only means of varying the speed of the pump. Since the extent of such variation is limited because of the characteristics of the engine, a power pump runs at a nearly constant speed.

Power slush pumps are designed for a specific piston-rod load. This load, sometimes referred to as "plunger load" and equaling the pump pressure times the area of the piston, is transferred to the gears and bearings of the power end of the pump and must not be exceeded if damage to the pump is to be avoided. From the point of view of the operator this means that for a given pump and for each size of liners, there is a maximum pump pressure which should not be exceeded. This fact, together with the constant pump speed above referred to, result in pump characteristics which may be illustrated by the following considerations:

Assume that a 7¼-by-16-in. power pump is to be used, with maximum rating of 300 hp. at 60 r.p.m. and with rated piston rod load of 27,000 lb. Assume further that 4½-in. internal flush drill pipe is to be used in a 9⅞-in. hole. The pump is run at speed of 50 r.p.m. Using the charts and formulas presented in preceding installments, the theoretical calculations given in following paragraphs are obtained. These data are presented graphically in Fig. 54.

With 7¼-in. liners and with a speed of 50 r.p.m., displacement of the pump is 545 g.p.m. For the assumed conditions this would result in annular velocity of around 180 ft. per minute. At a depth of 2,000 ft., for example, the pressure under these conditions would be around 600 psi. With pump efficiency of 85 per cent the input power requirements would be 234 hp.

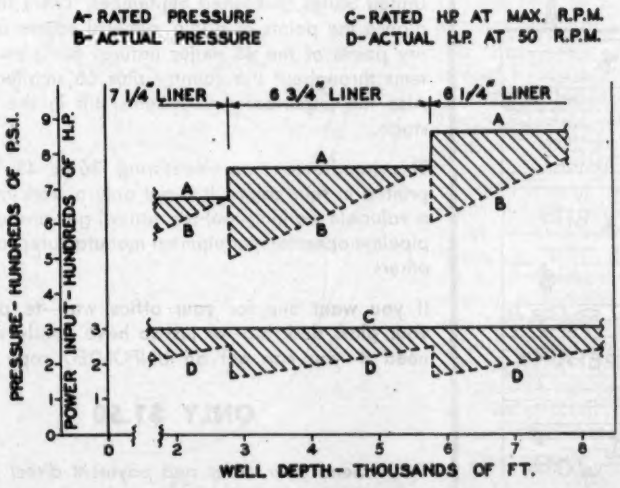
A- RATED PRESSURE
B- ACTUAL PRESSURE
C- RATED H.P. AT MAX. R.P.M.
D- ACTUAL H.P. AT 50 R.P.M.
7 1/4" LINER
6 3/4" LINER
6 1/4" LINER
PRESSURE- HUNDREDS OF P.S.I.
POWER INPUT- HUNDREDS OF H.P.
WELL DEPTH- THOUSANDS OF FT.

Fig. 54—Pressure and power characteristics of a power slush pump

For the given piston-rod load the maximum pressure for 7¼-in. liners is 665 psi. Under given conditions this pressure would be reached at the depth of around 2,800 ft., which would necessitate change of liners. The indicated change would be to 6¾-in. liners.

With 6¾-in. liners the displacement of the pump at 50 r.p.m. would be 470 g.p.m. This would result in an annular velocity of around 150 ft. per minute. For this circulation and for given sizes of drill pipe and hole the pressure at 2,800 ft. would then drop to around 500 psi., and power requirements to around 160 hp.

For given piston-rod load the maximum pressure for 6¾-in. liners is 760 psi. Under given conditions this pressure would be reached at around 5,800 ft. Power input would be then 240 hp. Another change of liners would be indicated.

At one of these progressive decreases in size of liners, the decrease in rate of circulation would reduce the annular mud-return velocity below the satisfactory figure. The point at which this would occur would depend on drilling conditions. Reduction of return velocity would affect unfavorably the rate of penetration and would result in drilling difficulties. Conditioning of the mud, to increase its viscosity would be resorted to, in order to prevent slippage of cuttings. This, however, would tend to accelerate the increase in circulating pressure which in turn would move up the point of change of liners.

Admittedly the conditions outlined above could be improved by increasing the annular velocity either through increase of the size of drill pipe or through reduction of the size of the hole made. The purpose of the example, however, is to illustrate certain facts relating to power pumps. One of these facts is the manner in which the characteristics of the pump limit its depth capacity. The other is lack of flexibility of the pump. Still another is the fact that potential of the pump is utilized only at infrequent intervals. This may be seen quite clearly in chart in Fig. 54 in which the shaded areas represent the unused potential of the pump.

Various advantages of a power pump, as an element of a mechanical-drive power rig, more than offset these unfavorable characteristics. As a result the power pump now competes favorably with steam slush pumps under all conditions except those of very deep drilling and those requiring very large volumes of circulation.

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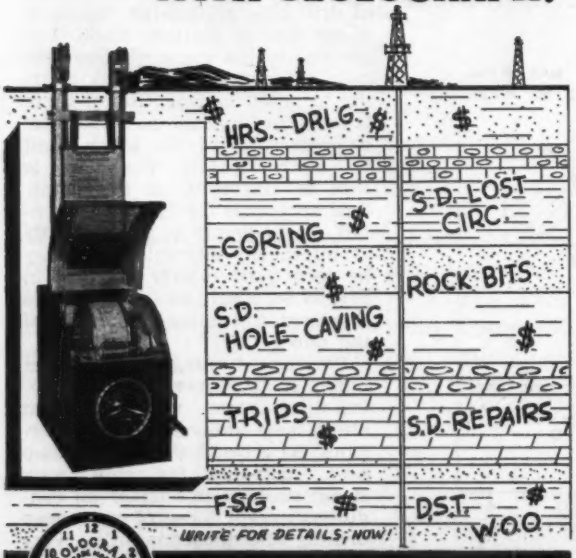

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ENGINEERING fundamentals

Darcy's Law—Radial Flow System

THE radial flow system has been used as an approximation of the quantitative expression of flow into a well from a surrounding reservoir. The present discussion will indicate the form of this equation and some of its characteristics.

Fig. 1 illustrates the properties of a radial system. Flow is assumed to occur between two concentric cylindrical surfaces, the outer of radius R_e and the inner of radius R_w. Over the cylindrical surface at R_e the pressure is a constant value P_e and over the cylindrical surface at R_w the pressure is a constant value P_w. Flow in this system converges from the outer cylinder to the central cylinder.

When Darcy's law in differential form is applied to a dr cylinder of the system, the resultant integrated equation of flow is:

$$Q_m = \frac{2\pi kh\,(P_e - P_w)}{\mu \ln R_e/R_w} \qquad (1)$$

where

Q_m = volume rate of flow measured at the arithmetic mean pressure $\frac{P_e + P_w}{2}$

h = height of the radial flow system

and the remaining terms signify quantities as previously defined. This equation expresses either gas or liquid flow since the volume rate is given at a mean pressure.

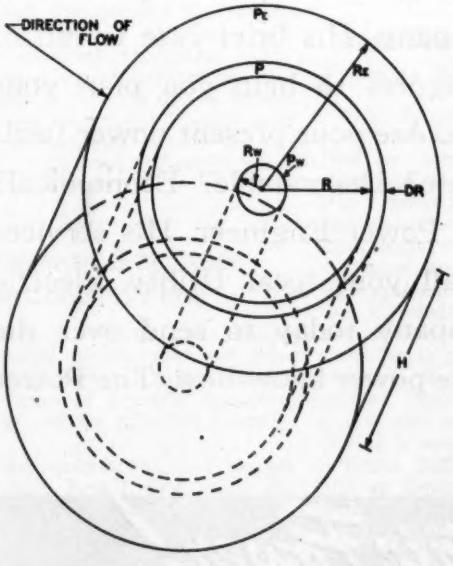


Fig. 1

It has been demonstrated by authorities on fluid flow that Equation 1 will hold to a good degree of accuracy even when the outer boundary of the system deviates considerably from the ideal cylindrical form. Thus, a well drawing from a uniform block system is represented by the radial flow formula within reasonable limits, an average cylindrical surface at radius R_e being substituted for the actual irregular surface.

The change in quantity of flow from a given radial system with a change in well radius R_w is demonstrated by considering the term $\ln R_e/R_w$. To double the rate of flow for a given R_e means to halve $\ln R_e/R_w$. For example for R_e = 1,000 ft., R_w would have to be increased from ¼ ft. to almost 16 ft. to double the rate of flow.

From the equation of flow, the variation of pressure with radius is easily demonstrated. Darcy's law holds for any or all parts of the system and, therefore, from R_w out to any radius R, the equation for a liquid is:

$$Q = \frac{2\pi kh\,(P - P_w)}{\mu \ln R/R_w} \qquad (2)$$

For a definite rate of flow, Q, in a system of given k, h, and μ, $\ln R$ must plot as a straight line against P. For example, Fig. 2 indicates the variation of pressure with distance from the well in a system in which the outer radius was chosen as 1,000 ft. and the well radius as ¼ ft. Over 50 per cent of the entire pressure drop occurs within the 16-ft. radius and over 75 per cent within the 125-ft. radius. This applies, no matter what the total pressure differential. When gas is flowing, the same curve applies for the pressure distribution if the pressure differential of flow approaches zero. For larger total pressure differentials, $(P_e - P_w)$, the curve becomes compressed more to the left and consequently within a given radius, the pressure drop would be a greater percentage than shown by Fig. 2. It is to be remembered that these considerations apply strictly speaking to instances where the pressures do not change with time, and where the system contains only that fluid which is flowing.

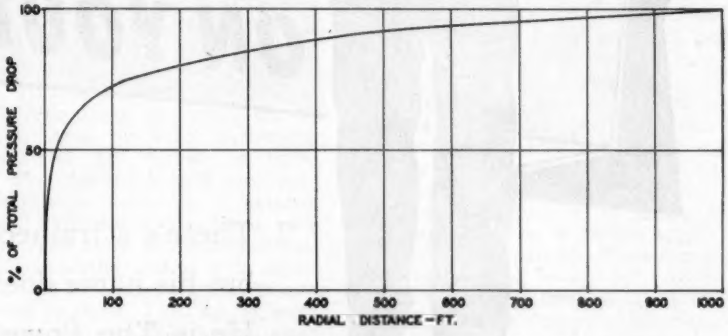
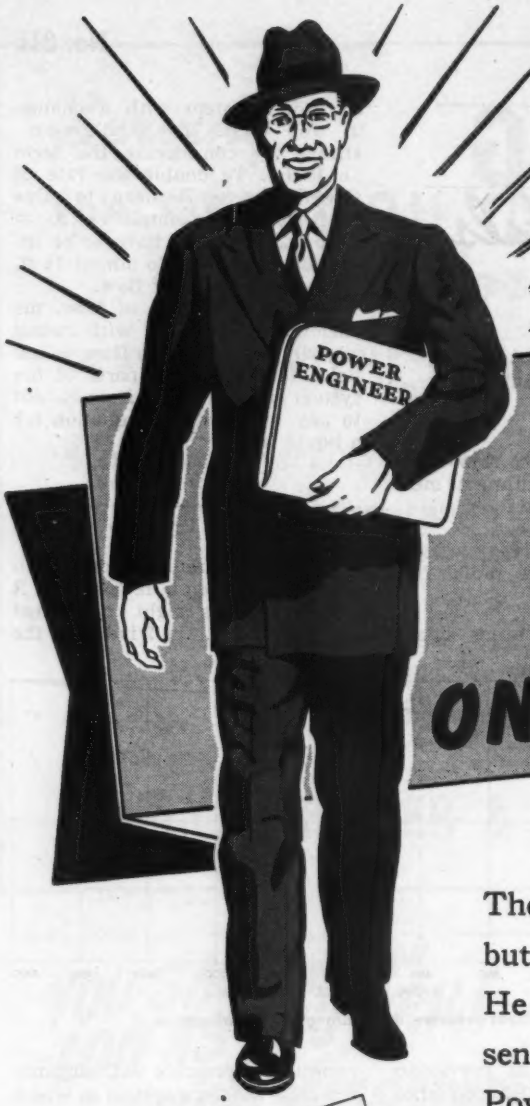


Fig. 2—Ideal pressure drop through a radial system

Series prepared by Dr. John C. Calhoun, Jr., Petroleum Engineering School, University of Oklahoma



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NATURAL GAS

New Underground Storage Approved for Ohio Fuel

Plans of Ohio Fuel Gas Co. to enlarge its underground storage in Perrysville field in Ohio have been approved by the Federal Power Commission. The project, estimated to cost $2,310,000, will permit the summer storage of additional gas from the Southwest and from Kentucky and West Virginia fields to serve the company's existing markets in central and northwestern Ohio.

The FPC approval authorizes the company to:

1. Construct a natural-gas compressor station in Monroe Township, Ohio, to serve as a repressuring station for the company's Perrysville storage area. Installed capacity of the new station would be five compressor units totaling 6,350 hp., which units would be moved from Treat and Pavonia stations. When the Monroe station is completed the existing Perrysville station and a portion of the Brown station will no longer be required and will be retired.

2. Construct about 22 miles of 16-in. gas-transmission line in Knox and Richland counties, Ohio, extending from Brown compressor station to the Monroe station and on to Pavonia station. Completion of this line would permit removal of about 39½ miles of smaller-diameter lines.

3. Extend the present Perrysville storage area by the addition of 13 partially depleted producing wells, thereby creating an additional estimated storage capacity of 1½ billion cubic feet of natural gas. Present well and gathering lines would be replaced to withstand increased pressures.

FPC Reissues Gas Rules In New Codified Form

The Federal Power Commission has approved codification and reissuance of its General Rules, including the Rules of Practice and Procedure, to become effective January 1, 1948.

Numerous amendments and changes adopted since June 1, 1938, when the original rules became effective, have not been available in one codified volume until now. The codification includes all changes and amendments in the rules made since June 1938 and in force January 1, 1948.

Finding that the codification and reissuance of the rules were necessary for convenient reference, FPC approved and adopted the codification which was printed in the Federal Register of December 19, 1947.

This new issue of the rules and regulations is now being printed in a form suitable for general use and will be available to the public in near future.

El Paso Natural to Expand in Arizona

The Federal Power Commission has authorized El Paso Natural Gas Co. to construct additional natural-gas pipe-line facilities at an estimated capital cost of $3,323,000.

The company proposes by means of these facilities to deliver a total of 20,000,000 cu. ft. of natural gas daily to Tucson Gas, Electric Light & Power Co. at Tucson, Ariz., and to Central Arizona Light & Power Co. at Phoenix, Ariz., to meet increasing demands for gas service in those cities. The deliveries will also permit additional service to a number of small Arizona communities now being served from existing facilities.

Facilities authorized include about 83 miles of pipe line ranging in size from 4½ to 16 in., 7,600 hp. of compressor capacity; a dehydration-plant addition; a gas-purification-plant addition, and appurtenant equipment.

Trans-Continental Line Protests Are Dismissed

The Federal Power Commission has denied without prejudice motions filed by Texas Eastern Transmission Corp. and the National Coal Association requesting dismissal of the second amended application of Trans-Continental Gas Pipe Line Co., Inc.

Trans-Continental's second amended application requested authorization to construct and operate a pipeline system to transmit natural gas from Texas gas fields to the eastern seaboard. Hearings on the application opened October 27, 1947, in Washington and continue in January, following a recess of 3 weeks.

Texas Eastern filed two motions, one on October 27, 1947, to dismiss without prejudice the application of Trans-Continental and the other on December 16, 1947, to dismiss the application without prejudice or in the alternative to continue all proceedings in the matter until Trans-Continental has established by satisfactory evidence certain conditions.

Natural Gasoline

Five Fields Served by Maysville Plant

A NATURAL-GASOLINE plant with unique features designed to serve five fields is under construction near Maysville, Okla., for five oil companies.

Initially the plant will have three units with a total of 12,800 compressor horsepower to handle approximately 45,000,000 cu. ft. of low-pressure gas daily, but it is so designed that the plant can be expanded to handle 85,000,000 cu. ft. daily and produce 300,000 gal. daily of natural gasoline, butane, and propane.

Gas will be collected for processing through gathering lines connected to wells in Elmore City, Southwest Antioch, Northeast Antioch, Maysville, and Lindsay fields. In Lindsay and the two Antioch fields gas will be stripped in remote absorbers by continuous circulation of absorption oil from the main plant at Maysville where all distillation and fractionating operations will be handled. However, each compressor station will be so constructed that additional equipment can be installed to make a complete plant should the gas supply warrant such expansion. These three fields will also be served by a compressor station designed to inject the gas back into the formation provided the operators agree on unitization of Antioch field. Remaining residue gas from this station and the main Maysville plant is expected to be sold to gas transmission companies.

The plant will be owned jointly by Cities Service Oil Co., Carter Oil Co., Sinclair Prairie Oil Co., J. E. Crosbie, Inc., and Warren Petroleum Corp. Construction is being handled by Dresser Engineering Co., Tulsa, under supervision of Warren Petroleum Corp., which will operate the plant. It is scheduled for completion in about 12 months.

Grimes, Others to Build Oklahoma Gasoline Plant

Otha A. Grimes, Tulsa independent operator, and some associates are planning to build a gasoline plant early in 1948 on a site which they have recently purchased in Hughes County, Oklahoma, east of Holdenville.

The plant will have a capacity of 4,000,000 cu. ft. of gas daily and will produce gasoline and butane-propane mixtures. The residue gas will be sold to other companies having lines in that area.

REFINING

Stanolind Soon to Start New Synthol Plant

STANOLIND OIL & GAS CO. will shortly begin construction on an $80,000,000 synthol plant in western Kansas, with consideration now being given to the Dodge City-Garden City area, according to Stanolind in an announcement by Gov. Frank Carlson of Kansas.

The plant, which is expected to be completed by January 1950, will be used for the conversion of natural gas to liquid fuels and chemicals and will be located near the Kansas portion of Hugoton gas field. Production of liquid fuels at the rate of from 7,000 to 8,000 bbl. per day, plus an estimated 100,000,000 lb. a year of chemicals is planned from the processing of approximately 100,000,000 cu. ft. of gas daily.

Carlson said that he had been advised by E. F. Bullard, president of Stanolind, that engineering on all details of construction was well advanced and that much of the "long delivery" equipment had already been purchased.

Alcohols, organic acids, aldehydes, and other oxygenated chemical compounds will be produced. These basic chemicals are under contract to U.S. Industrial Chemicals, Inc., New York, which will have its warehousing and distributing operations located adjacent to the conversion plant site.

Approximately 4,000 workers will be required during the construction period, and for operation of the plant a permanent force of about 600 is expected to be employed.

Sinclair Refining in Midst Of Large Expansion

Total capacity rating on five of the eight processing units now under construction at Sinclair Refining Co.'s three largest plants is upwards of 135,000 per day. The company's East Chicago, Ind., refinery, smallest of the three larger plants, is being equipped with a fluid cracking unit, new crude still, poly plant, and a lube-treating plant. At the Houston plant, Sinclair's largest of 10 refineries, a new crude still and a barrel house and grease works are being installed. Projects under way at Marcus Hook, Pa., include a poly plant, fluid cracking unit, and vacuum stills.

Scheduled completion dates on the fluid unit at East Chicago and the vacuum stills at Marcus Hook, both contracted to C. F. Braun & Co., are set for this month. Capacity of the fluid units at East Chicago and Marcus Hook are rated at 25,000 bbl. per day each and that of the vacuum stills at 24,000 bbl. per day. The fluid cracking unit for Marcus Hook, also on construction contract to Braun, is scheduled for completion in February. Other projects under contract to Braun are the poly plants at East Chicago and Marcus Hook which are scheduled for completion in April of this year, and the East Chicago refinery crude still. This still is scheduled for completion in June.

Lummus Co. is contractor for the lube-treating plant at East Chicago. Completion schedule for the treating plant, a 2,500-bbl.-per-day unit, is set up for July. Contractor for the crude still and barrel house and grease works at Houston is Flour Corp., Ltd. Completion schedule on the crude still is March of this year and that on the barrel house and grease works is the following August. Designed capacity ratings on the crude stills for East Chicago and for Houston are 30,000 bbl. per day each.

Berry Asphalt Constructing Lube-Oil Unit

Construction of a new lubricating-oil unit and expansion of asphalt-specialty facilities are under way at the Waterloo, Ark., refinery of Berry Asphalt Co. This plant, which now processes 1,200 bbl. daily of crude oil, produces lubes and asphalts besides other products obtained in its skimming operations.

Plans are under consideration for expanding pipe-line and asphalt facilities and storage capacity at the company's plant at Stephens, Ark. In addition to a 2,000-bbl.-daily skimming unit, asphalts are also processed at the Stephens plant.

Refineries End Year With Two New Output Records

Refineries of the United States wound up the calendar year by establishing two new records, according to the statistical report of the American Petroleum Institute for the week ended December 27.

Total runs of crude oil to refineries during that week averaged 5,543,000 bbl. daily. Not only was this figure 297,000 bbl. daily above the preceding week, but it exceeded by 225,000 bbl. daily the previous all-time high crude run of the week ended September 13.

During the last full week in December gasoline production totaled 17,013,000 bbl., an increase of 1,007,000 bbl. over the previous week and slightly above the former record established last August. Part of this, however, may be attributed to the fact that stocks of unfinished gasoline at refineries dropped 661,000 bbl. during the week. As a result, stocks of gasoline increased 4,213,000 bbl., the largest increase in any week for several years, and reached 91,269,000 bbl., which is close to the 1946 stock level.

Petrol Terminal Schedules Eastern Deliveries Soon

The first shipment of fuel oil and other products from the Petrol Terminal Corp. refinery at Texas City, Tex., is expected to reach the East Coast around the middle of January. Operations of the refinery commenced December 13.

The refinery was an inactive war plant and was built and operated for Defense Supply Corp. It was acquired by Petrol Terminal Corp. from War Assets Administration in August 1947.

Present processing capacity of the plant is 27,000 bbl. daily. Production will be confined to motor fuels, distillates, and residual oils. One-hundred-octane gasoline also will be produced when installation of a 54,000-bbl.-a-day topping unit is completed. All work on the refinery is expected to be completed by July 1948.

In addition to supplying civilian requirements, the refinery will also furnish petroleum for the armed forces.

Petco Will Increase Storage Facilities

Petco Corp., Milwaukee, will complete the installation of additional storage at its Marrero, La., refinery early this year. Other construction contemplated for the refinery during 1948 includes increased skimming and cracking facilities which is now in the drafting board stage, and a new dock. The refinery is rated currently at 5,000 bbl. daily. The thermal cracking capacity is 1,800 bbl. per day.

Expansion at Petco's other refinery at Blue Island, Ill., includes additional storage, which is now on order, and a reforming-process installation which is in the planning stage at this time. Also under consideration for the Blue Island plant are pipe-line connections for crude oil and finished products. Current ratings of the

Chicago-area plant are 10,000 bbl. daily topping capacity and 2,200 bbl. per day for thermal cracking.

Troy Will Move Its Skimming Plant

Plans are being worked out by Troy Refining Co., Inc., for moving its 1,800-bbl-per-day skimming plant from Troy, Ind., to a more favorable location, according to company officials. The home office is located at Evansville, Ind. Current plans call f. increasing the refinery's capacity when it has been moved to the new site.

Bay Petroleum Completes Thermal Reformers

Bay Petroleum Corp., which operates refineries at McPherson, Kans., and Denver, recently completed the construction of a 1,000-bbl.-per-day thermal reformer at each of the two refineries. Estimated cost on both of the units totals upwards of $250,000. Refinery Engineering Co. was contractor for the unit installed at McPherson whereas the Denver job was handled by company engineers who also erected a 100-bbl.-per-day U.O.P. polymerization unit at the same refinery.

Diesel Manufacturers Will Survey Future Fuel Needs

The Diesel Engine Manufacturers Association has agreed to make a survey to determine how much diesel horsepower is now in operation in each state, together with an estimate of how much this horsepower is likely to increase during the next 5 years.

A principal purpose of this survey is to inform petroleum refiners of the present and potential market for diesel fuel on a geographical basis in order to assist the oil industry in meeting the growing demands for this product.

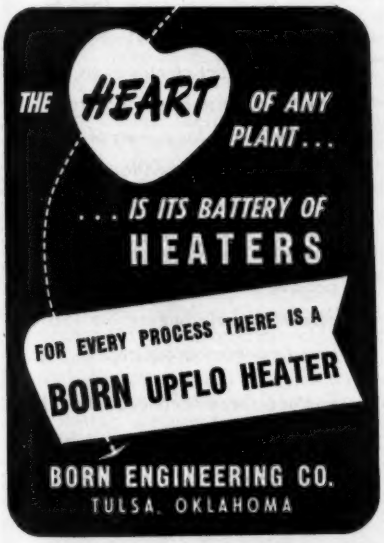
The survey was agreed upon at the annual meeting of the association in December at which refining and marketing officials of a number of oil companies discussed the outlook for diesel fuel and the difficulties of meeting quantity and quality requirements. The oil men told the engine manufacturers that the staggering increase in diesel fuel demand since the war has thrown a heavy load on the refining industry and that any modification in specifications which leads to simplicity and uniformity will result in making more fuel available.

Cycloversion Unit Slated For April Completion

Construction work on the Cycloversion unit at the Wood River Oil & Refining Co., Inc., refinery at Hartford, Ill., is scheduled for completion in April. Estimated to cost approximately $1,000,000, the unit is designed for a capacity of 8,000 bbl. per day. Koch Engineering Co. is the contractor.

Cooperative Expansion Program Includes Perco Unit

Facilities of the 18,000-bbl.-per-day crude-oil capacity refinery of National Cooperative Refinery Association, at McPherson, Kans., are being expanded to include a Perco catalytic reforming unit. The new unit, rated at 5,000-bbl.-per-day capacity is scheduled for completion during the early months of 1948. Koch Engineering Co., Wichita, Kans., is the contractor. Current rating on the refinery's thermal cracking input is 28,000 bbl. per day.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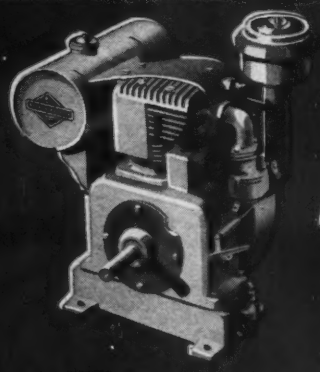

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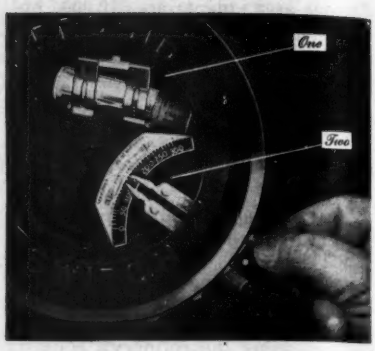

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PIPE LINES

Michigan-Wisconsin Pipe Laying Under Way

THE first half mile of the Michigan-Wisconsin Pipe Line Co.'s gas line was completed in the middle of December in the Panhandle area by the contractor, J. R. Horrigan Construction Co.

In connection with arrangements for financing the Michigan-Wisconsin project, American Light & Traction Co. has obtained Securities and Exchange Commission approval which will allow it to continue as a holding company for the integrated gas utility system which is undertaking the building of this line to cost approximately $104,000,000. The line will be built of 24-in. pipe from the Texas Panhandle to a point near Millbrook, Ill. From there the system will have 22-in. pipe to the Austin gas storage field in Michigan.

American Light's plan, filed jointly with United Light & Railway Co. and recently approved provides for Railway's divestment in American Light and subsidiaries by the end of 1948.

American Light will retire its outstanding, noncallable preferred stock at $33 a share, dispose of its holdings in Detroit Edison Co., and distribute to its common stockholders its investment in the common stock of Madison Gas & Electric Co.

With the completion of those transactions the company will remain as a holding company over Michigan Consolidated Gas Co., in Detroit; Milwaukee Gas Light Co., serving the Milwaukee area; Austin Field Pipe Line Co., Milwaukee Solvay Coke Co., and Michigan - Wisconsin Pipe Line Co.—the firm which will build the pipe line.

The pipe line, scheduled for completion in 1950, will triple the supply of gas in the Detroit area and will bring, beginning in 1952, rate reductions totaling $11,000,000 annually to Michigan Consolidated's customers and $4,600,000 annually to Milwaukee Gas Light's consumers, a company spokesman said.

Panhandle Eastern Pipe Line Co., sole source of natural gas in the Detroit and Ann Arbor districts, opposed the company's plan to build the pipe line, but the SEC declared it had "no authority to pass upon or question the validity of the Federal Power Commission certificates" which have authorized its construction.

This week, depositions are being taken at the office of Federal Power Commission, Washington, by Phillips Petroleum Co., Skelly Oil Co., Stanolind Oil & Gas Co., and Magnolia Petroleum Co., in preparation for a trial during the spring of this year in the Federal Court at Tulsa, when Phillips will ask the court to render a declaratory judgment stating that contracts are in full force with Skelly, Stanolind, and Magnolia to furnish natural gas from Hugoton field. This gas was to be processed by Phillips before delivery to Michigan-Wisconsin Pipe Line Co. The defendants gave notice December 2, 1946, that contracts had been canceled because a valid certificate had not been is-

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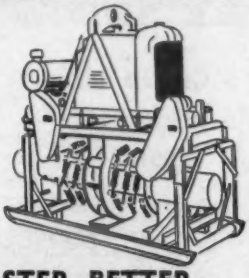

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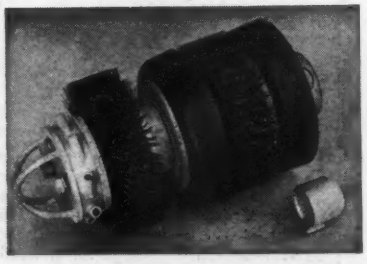

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sued by FPC for the construction of the Michigan-Wisconsin project.

Interstate Installing 850-Hp. Unit at Oklahoma City

Interstate Oil Pipe Line Co. is nearing completion of the installation of a pumping unit at the company's station in the southeastern suburbs of Oklahoma City. This unit, having a capacity for pumping at the rate of 37,000 bbl. daily at 1,000 psi., consists of a centrifugal pump driven by a 850-hp. turbo-supercharged diesel engine. By the installation of this large unit the company is replacing several smaller units which had a combined capacity of 30,000 bbl. daily at 800 psi. Revamping and installation work at the Oklahoma City station has been done by Oklahoma Engineering Co.

In the laying of the Maysville-Oklahoma City 45-mile 12-in. crude oil pipe line the contractor, Midwestern Constructors, has been laying at the rate of 2 miles daily in recent weeks. As a result of pushing construction to take full advantage of good weather in December, pipe laying had progressed to such an extent that only 10 miles remained to be laid early this week. The project is under the supervision of George B. Randels, general superintendent, northern division, and G. C. Pollard, district construction superintendent, Interstate Oil Pipe Line Co. M. T. Wilhite is in charge of Midwestern Constructors' operations.

Arizona Pipe Line Plans for Permian Basin-Phoenix Line

Plans of Arizona Pipe Line Co. to build a 620-mile, 8-in. crude-oil pipe line from the Permian Basin to Phoenix, Ariz., will be discussed at a directors meeting to be held this month. This company, incorrectly referred to as Phoenix Pipe Line Co. in previous reports, is a subsidiary of Arizona Petroleum Corp. which also holds Phoenix Refining Co. A 10,000-bbl. refinery to be built at Phoenix, Ariz., by Phoenix Refining Co., is reported to be under consideration for construction in 1948 prior to the laying of the 620-mile Arizona Pipe Line project, which at present does not have prospects for getting pipe deliveries before the first half of 1951.

The Arizona Pipe Line project is to be built initially with four pump stations which would give the system a throughput of 14,000 bbl. daily. By the addition of four stations later, throughput would be raised to 17,500 bbl. daily.

Affairs of Arizona Pipe Line Co. are being handled by Frank E. Richardson, consulting engineer and director, whose address is Box 142, Kansas City, Kans. Other directors actively concerned with the development of plans for the project are: J. S. Maguire, Kansas City, and Dell Webb, Phoenix, Ariz.

Richardson is consulting engineer for Powder River Pipe Line Co., incorporated December 5, 1947, headed by E. F. Underwood as president, with headquarters at Denver which is preparing to lay a 13-mile, 6-in. crude oil line from the Mush Creek field to Newcastle, Wyo.

Barranca-Berrio Line Is Inaugurated in Colombia

Tropical Oil Co.'s Barrancabermeja-Puerto Berrio, Colombia, 65-mile, 6-in. products pipe line was inaugurated December 27 with ceremonies at Barrancabermeja attended by government officials.

The line has been built of invasion pipe with bolted couplings by engineers of Andean National Corp. under the direction of C. T. Armstrong; Floyd E. Waterfield, Jr., Oklahoma Engineering Co., has been consultant. The line has been tested with water pressure.

The southern terminus of the line is at storage tanks at Cantimplora, located on the eastern bank of the Magdalena River. Work has been recently in progress for the laying of two 3-in. lines across the river to Puerto Berrio on the western bank.

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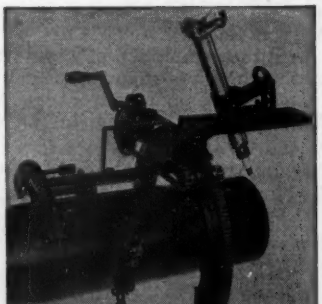

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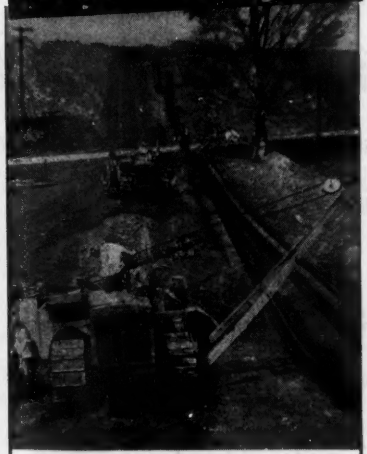

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It is expected that most of the products handled will be shipped south by tank boats and barges to La Dorada to facilitate distribution of refined products in the central part of Colombia. Completion of the project is reported to be preparing the way for the building of a line from Puerto Berrio to Medellin by either the Antioqui Railroad or other interests.

Products handled through the line include motor gasoline, tractor fuel, kerosene and diesel fuel. Shipments are moved from Tropical refinery tanks by four Bingham-General Electric stuffing boxless pumps to a Gaso reciprocating pump driven by a 115-hp. Caterpillar diesel engine which pumps products to the Cantimplora tanks.

San Juan Basin Data Shows Significance of Pipe Line

The significance of the area to be served by the 470-mile, 26-in. San Juan Basin, N. M.-Needles, Calif., gas line announced in recent months by El Paso Natural Gas Co. is indicated in data presented in an article on page 64 of this issue.

This article on Deep Geological Basins in the United States shows the location of the San Juan Basin and gives some idea of what the geologists think of the future potentialities of this and adjacent areas. Apparently this pipe line which is to connect with the Pacific Gas & Electric Co. system at Needles has been planned with an eye to future potentialities as well as presently proven reserves.

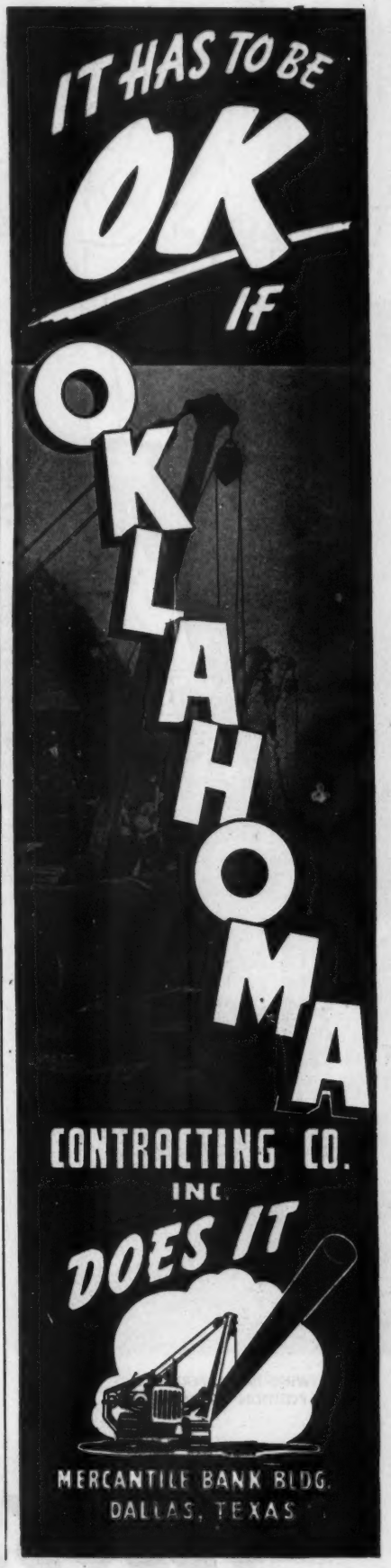
Survey Completed for Huge Canadian Project

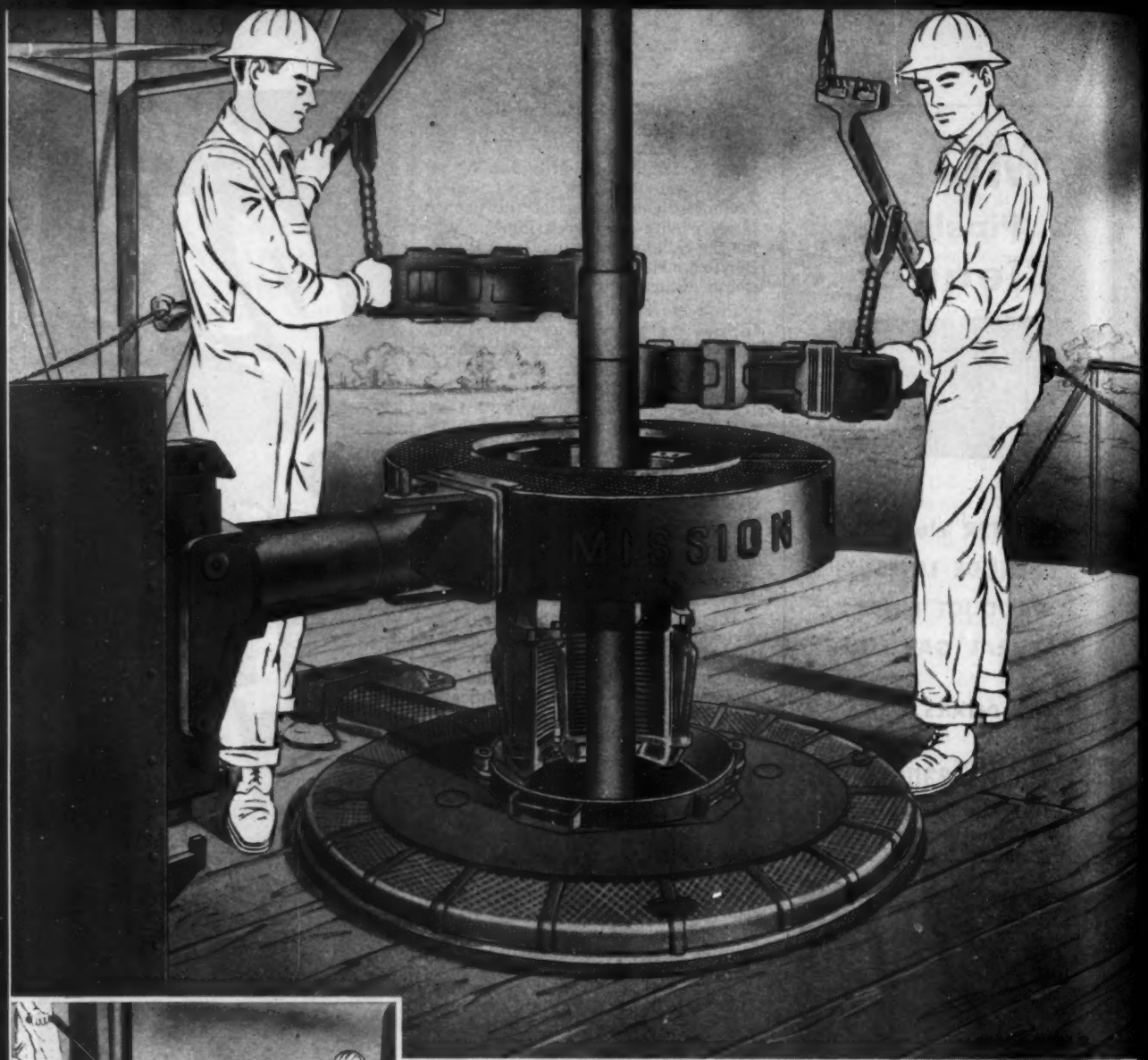
VANCOUVER, B. C.—Announcement has been made here by Richard B. Hahan, vice president of Northwest Natural Gas Co., that tentative survey of a pipe line route to deliver gas from Alberta to Spokane, Portland, Seattle, and Vancouver has been completed. Cost of the line is estimated at $80,000,000.

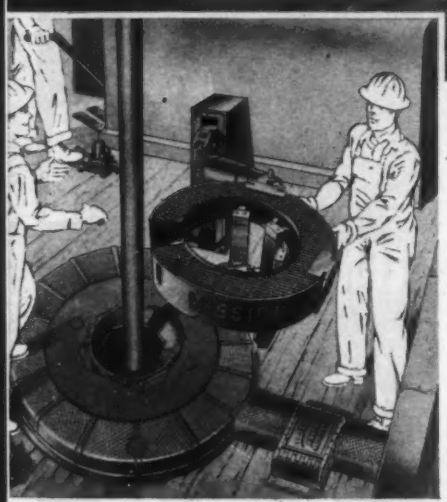
Major producers in Alberta holding extensive proven gas reserves will be approached for contracts, after which export rights will be sought. Approval of both the Dominion and provincial governments will be necessary before export rights are secured.

El Paso Plan Approved

The Federal Power Commission has approved El Paso Natural Gas Co.'s proposal to spend $3,300,000 on additional natural-gas pipe-line and compressor facilities. The project calls for construction of 83 miles of line, ranging from 4½ to 16 in. in diameter.







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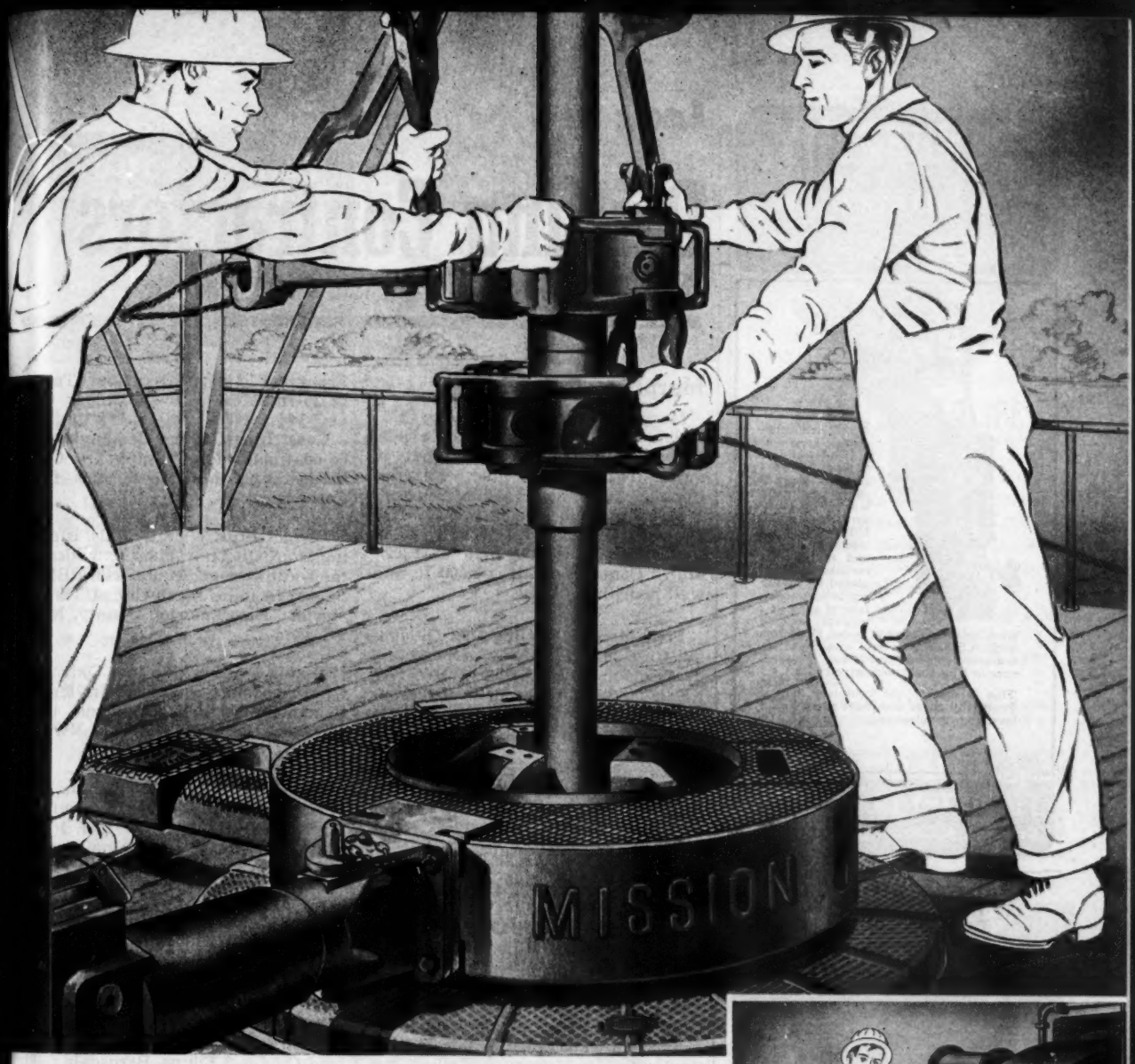

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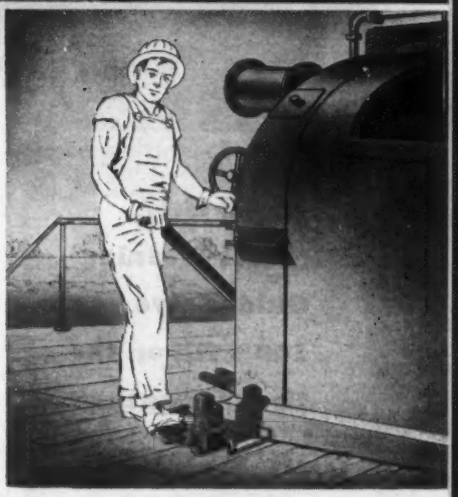

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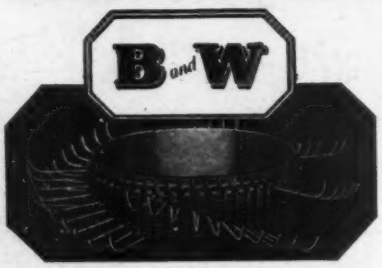

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Among the Drilling Contractors

Murphree & Bond Hit

Murphree & Bond Drilling Co., Oklahoma City, has a possible pool opener near Estancia and about 50 miles from Albuquerque, Torrance County, New Mexico. The concern's 1 Berkshire is located in NW NE NW 19-6n-9e and has hit saturation in Pennsylvanian sandy lime at 2,520-670 ft. Contract depth is 3,400 ft. and well is drilling ahead.

Fred Morgan Drilling Co., Oklahoma City, and Max Pray are erecting derrick for their 1 Harris, SW NW NE 29-9n-3w, 1 mile north of discovery well of newly opened Newcastle pool, northern McClain County, Oklahoma.

Rocky Mountain Drilling Co., Los Angeles, has received contract for Richfield Oil Corp. 4 Vail, East Los Angeles field, California.

Stewart Drilling Co. has started British-American Oil Co. A-2 Johnson-State, SE SE SE 20-16s-25w, Cypress Lake field, Miller County, Arkansas.

Big Chief Drilling Co., Oklahoma City, Vaughey & Vaughey, and D. A. McCrary are starting 1 Hester, ¾-mile west offset to discovery well of the newly discovered Oldenburg field, Franklin County, Mississippi. Test is in 25-7n-2e on a 225-acre block.

Coast Line Drilling Co., Inglewood, is contractor for Wilshire Oil Co. 7 Santa Fe, Santa Fe Springs field, California.

Dwight Ross, Wichita Falls, is drilling Hunt Oil Co. 1 Thorpe, wildcat in the southwest of Section 243, BBB&C Survey, 4 miles northwest of Throckmorton, Throckmorton County, North Texas.

Texola Drilling Co., Inc., Oklahoma City, has started a 2,200-ft. test in Comanche County, Oklahoma, its 1 J. Mack Harrison, NW NE NW 25-4n-11w.

Mallard Drilling Co., Wichita, and Westgate-Greenland Oil Co. are drilling 1 Burk, NW NE SE 7-18s-1, 1 mile south outpost to Hoffsommer pool, McPherson County, Kansas.

Dee-Watson Drilling Co. is contractor for Illinois Mid-Continent Co. 7 Edith Marie Burkett, 2,900-ft. test, W½ NW 24-1s-12w, Gibson County, Indiana.

William Thornbury, Fillmore, Calif., is contractor for deepening of Cleveland Oil Co. 3 Elkins, Bardsdale field, California.

Diesel tractor with winch being used to move a cable-tool drilling rig—a load of approximately 25 tons—to a new location in Bradford, Pennsylvania, field

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Merrill Drilling Co. Mt. Pleasant, is starting two wells in Bentley field, Michigan. They are 1 Edith P. Kobetich et al, SE NE NE 34-17n-2e, and 2 Connolly Estate, SW NW NW 35-17n-2e.

John Hoosier will drill Dale F. Goodson 1 Oldt, wildcat in King and Nelson Survey A-2, 3 miles northwest of Scurry, Kaufman County, East Texas. Well is scheduled for Travis Peak test.

Commonwealth Drilling Co. Calgary, Alta., has a string of tests active in Lloydminster field, Canada. Recent wells include Command-Lloyd 2, SE 10, 16-50-1w4, finished at 1,932 ft. and Command-Lloyd 4, NW 10, same section, recently started. Commonwealth is also drilling Gibb-Mac 2, SW9, 34-29-1w4 for W. Hale interests.

Spencer Cook, Allegan, Mich., has contract for Ohio Oil Co. 1 Arley C. Sweet, wildcat in SW SW NW 8-1n-14w, Allegan County, Michigan.

Crissman Drilling Co. has received contract to drill Porter, Sesnon & Associates 1 Thomas, Huntington Beach field, California.

Penrod Drilling Co., Shreveport, is completing Hunt Oil Co. 1 Louisiana Delta Lumber, wildcat in NW NW 6-4n-5e, 6 miles west of Argo, Catahoula Parish, Louisiana.

Suntex Drilling Co., Oklahoma City, has extended South Davenport pool, Lincoln County, Oklahoma, to northeast with its 1-A Chapman, SE SW SE 10-14n-5e.

Ervin Major, Standish, Mich., is starting two Michigan wells. First is his A-1 Ben Bis, NW NW NE 2-16n-4e, Pinconning field, Bay County, and second is his 1 Mrs. Walter H. White, SE SW SE 28-10n-7e, Arbela field, Tuscola County.

Crow Drilling Co., Shreveport, is below 7,000 ft. at R. H. Crow 1 Sutton, wildcat in C SW SE 18-17n-6w, 3 miles northwest of Bryceland, Bienville Parish, Louisiana.

Commonwealth Drilling Co., Calgary, Alta., has completed Community Services 34 and 35 in Saskatchewan section of Lloydminster field, with both tests now waiting for service rigs. A rig is being moved to Command-Lloydminster 3.

Robert W. Atha, Mt. Pleasant, will drill Gulf Refining Co. 2 Friebe-Knochel, C S½ NW NW 35-15n-5e, Kawkawlin field, Bay County, Michigan.

Cowart & Dix Drilling Co. has been organized in Bellflower, Calif., to engage in shallow-well drilling.

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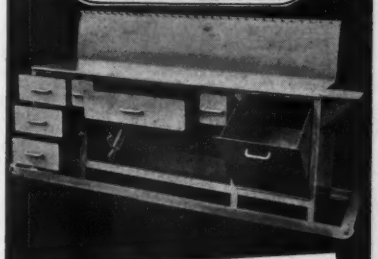

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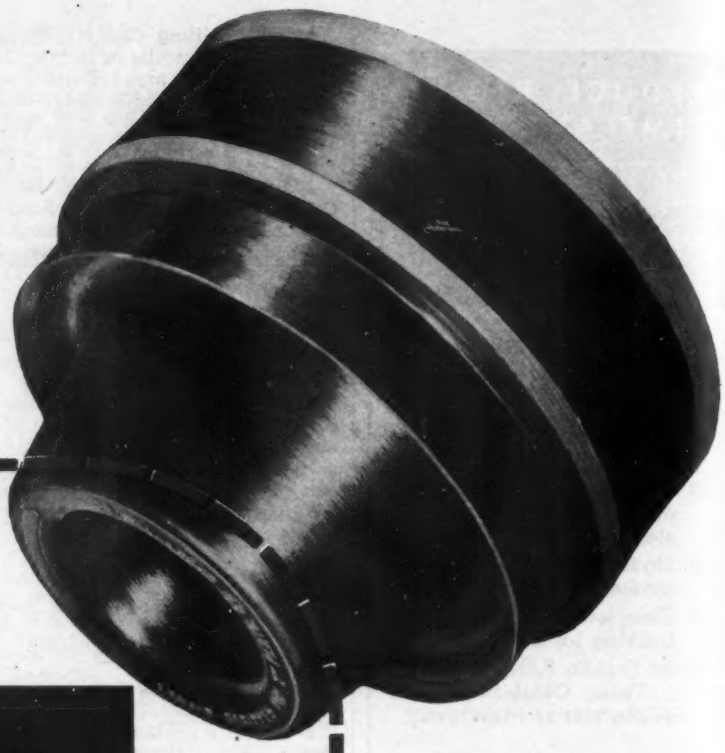

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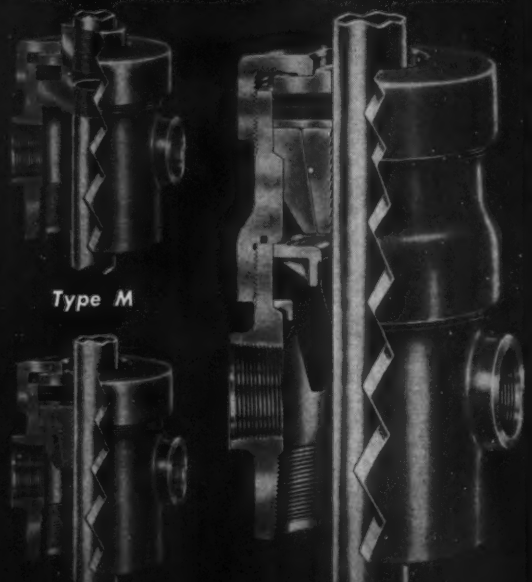

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Exploration and Drilling

Pre-Permian Oil in Midland Basin

THE release of official information on Slick-Urschel Oil Co. et al 1 Alford, deep Ellenburger discovery in West Texas, justifies the attention given this well for many weeks by far-sighted oil men. The discovery is located in the extreme eastern part of Upton County, 12 miles northeast of the town of Rankin, and about 9 miles north and west of Big Lake field in Reagan County.

On a 10-hour official potential test it flowed an average of 37 bbl. per hour of 56°-gravity oil, through a ⅜-in. tubing choke, with a gas-oil ratio of 4,000 cu. ft., with tubing pressure of 1,850 psi., and casing pressure of 2,400 psi. Production is from the Ellenburger lime, through perforations in the 5-in. casing at 11,885-11,910 ft., 11,945-60 ft., and 11,975-85 ft., after a 1,500-gal. acid treatment. The gas-oil ratio indicates that this is definitely an oil well, even though the gravity is rather high.

Regional Geology

This test has cut 1,002 ft. of Ellenburger lime without finding any water. Correlations with the Ellenburger section in Big Lake field indicate, according to the operators, that there are probably several hundred more feet of Ellenburger section present. Since cuttings from the bottom of the hole showed staining and good saturation, the bottom of the pay has probably not yet been reached. If Big Lake experience is paralleled in the future, subsequent wells may be completed lower in the Ellenburger section with lower-gravity oil and smaller gas-oil ratios.

The discovery lies east of the Central Platform, definitely down in the deeper part of the Midland basin. Geological interpretation of surface and subsurface data, plus seismograph work, indicated the presence of a structure. While it lines up with Todd, World, and Big Lake fields, and therefore may include a regional fold, this fold, even if it exists, is comparatively a minor flexure compared to the Central Platform. Geologically the new producer confirms the fact that a structural closure in the deep Midland basin may produce oil, regardless of great depth.

Exploration men will also note with great interest that the new producing structure differs from Big Lake, Todd Deep, and Barnhart in that the Ellenburger is not "bald headed," i.e., sticking up so high that whole geological sections either never were deposited over the top, or were completely eroded at some stage of the folding. In these previously discovered fields, Ellenburger production is found immediately below the Pennsylvanian on top of the structure, although at Big Lake and Todd the low edge wells find a little Ordovician Simpson section above the Ellenburger.

In the new discovery, about 1,000 ft. of pre-Pennsylvanian Paleozoic sediments lie on top of the Ellenburger, and apparently no sharp angular unconformity exists at the top of the Ellenburger. This may be very important as indicating that Ellenburger structural traps do not have to be extremely high regionally in order to produce oil. This is the deepest Ellenburger production in West Texas, from the thickest Ellenburger section so far found productive.

HIGHLIGHTS OF WEEK'S DEVELOPMENTS

ROCKY MOUNTAIN.—Madison lime proves productive at Lost Soldier field in south central Wyoming. Sinclair-Wyoming's deep test flows 418 bbl. per day after acidizing. Kibby sand discovery in Musselshell County, Montana, has been shot by Texas Co. Same company's deep Powder River basin test in Wyoming is testing Converse sand, where promising drill-stem test was made.

CALIFORNIA.—Eocene sand test at Middle Dome, Kettleman Hills, finally completed for 1,000 bbl. of 46° gravity oil and 20 to 30 million cubic feet of gas daily. Standard of California 1 Maxwell in Ventura County is still drilling, below 17,250 ft., a new depth record for the state, but 575 ft. short of world's record.

OKLAHOMA.—Deep Stanolind Oil & Gas Co. wildcat in Grady County, which may have world's deepest production, will drill ahead to test Oil Creek sand in lower Simpson. Gas & Oil Industries, Inc., have second well showing in newly revived Papoose field of Hughes County.

KANSAS.—Robert L. Williams hits possible pool opener with wildcat ¾ mile northwest of Kowalsky pool, Barton County. New Arbuckle pool opening up 1 mile east of Mueller pool, Stafford County.

SOUTH LOUISIANA.—Magnolia Petroleum Co. is starting new 12,000-ft. wildcat in 36-5s-1w, Evangeline Parish, 2 miles southwest of 1 Reed, a 12,365 ft. dry hole which had numerous tests in Lower Wilcox.

EAST TEXAS.—A new low-gravity oil pay has been found in Chapel Hill gas field, Smith County at 5,594-5,615 ft. by Chapel Hill Gas System 2 J. B. Yancey, John Dillard Survey. A new gas-condensate pay zone in the Travis Peak will be produced at Tri-Cities field in Henderson County, if application for dual completion permit is granted for W. B. Hinton 1 Evans.

WEST TEXAS.—Sun Oil Co. test opens second Pennsylvanian pool in Coke County, flowing 447 bbl. of 48°-gravity oil, 4 miles southwest of Jameson pool. Ellenburger production extended 1¼ miles on north side of Goldsmith Clear Fork field in Ector County. Wildcats in Sterling and Hale counties have favorable drill-stem tests in Pennsylvanian.

CANADA.—New wet-gas field of Turner Valley type, from Madison lime, may be opened in southern Alberta foot-hills, near Montana border, by Canadian Gulf in Pincher Creek district.

MICHIGAN

Six Oil, Two Gas Wells Recorded in Past Week

SAGINAW.—Twelve of the 20 Michigan oil and gas field completions for the past week were dry holes, seven of them being wildcats. Six oil producers and two gas wells were recorded. Of the 2,530 bbl. initial from the new producers, 2,200 bbl. came from two more Kimball Lake completions in Newaygo County. A 168-bbl. producer in Oceana, one for 90 bbl. in Crawford County, another for 50 bbl. in Bay County and a 22-bbl. Montcalm well made up the rest of the new production. The two gas wells aggregating a little over 10,000,000 cu. ft. were in Montcalm County:

MICHIGAN WILDCAT FAILURES

Allegan County, Dorr Township: P. F. Broughton 1 Carl and Annabella Graczyk, SW NW NE 28-4n-12w, dry in Traverse limestone, TD 1,639 ft.

Fillmore Township: Ford Oil Co. 1 Abraham Anoory, SW NE SE 6-4n-15w, dry in Traverse limestone, TD 1,548 ft.

Monterey Township: Ford Oil Co. 1 Claude Parker, NE NE SE 3-3n-13w, dry in Traverse lime zone, TD 1,671 ft.

Clinton County, Essex Township: Homer Fulton and Tom Wyllys 1 Ronald McPherson, NW NW SE 9-8n-3w, dry in Dundee, TD 2,990 ft.

Ionia County, North Plains Township: T. F. Caldwell 2 W. F. McKenna, SW NE NW 9-8n-5w, dry in Dundee, TD 3,086 ft.

Lake County, Ellsworth Township: Sohio Petroleum Co.-Americrude Oil Co. 1 J. J. Shaw, SW NW SW 7-19n-11w, dry in Dundee, TD 3,491 ft.

Roscommon County, Richfield Township: J. O. Mutch 1 Emory B. Hollowell, NW NW NW 2-24n-1w, dry, TD 4,412 ft.

ROCKY MOUNTAIN

Sinclair Deepens Test From Tensleep to Madison

DENVER.—Deepening to the Madison at around 4,800 ft. of Sinclair-Wyoming Oil Co.'s test at 77 Unit "A," SE NE NE 10-26n-90w, Lost Soldier field, Sweetwater County, Wyoming, indicates an important reserve in that horizon. The well was drilled to 5,039 ft. and plugged back to 5,031 ft. The casing was perforated with 568 holes at 4,950-5,030 ft. and the well swabbed 88 bbl. of oil in 12 hours. It was then acidized with 2,000 gal., and flowed and swabbed at the rate of 234 bbl. per day. It was reacidized with 4,600 gal. and made 418 bbl. in 24 hours. The well was deepened from the Tensleep, where it was completed in 1938. This well also found production in the basal Amsden sand and on drill-stem test at 4,675-4,733 ft. made 1,335 ft. of 35.7°-gravity oil in 30 minutes. This test was made when the formation was drilled, and casing has not been perforated opposite this zone for further testing.

Montana's Ragged Point.—After shooting its 1 Manion, SE SW SE 5-11n-30e, the important Kibbey sand producer at Ragged Point, Musselshell County, Montana, The Texas Co. is now cleaning out the hole.

Little Laramie wildcat.—Superior Oil Co. and California Co. are reabandoning 1 Bath, NW NW SW 4-16n-75w, after failing to find production in a deeper zone in the Tensleep. The well was deepened from 3,886 ft., total depth, to 3,961 ft. in the hope of finding production in the zone productive at nearby Quealy dome and Herrick dome. Top of the porous section correlating with the Herrick pay was found at 3,901 ft. and carried water. This well was drilled in 1936 by California Co. and found the Muddy, Dakota, Sundance and upper Tensleep sands dry at that time.

Powder River basin deep test.—Interest is still focused on The Texas Co. 1 Unit, C NW NE 2-52n-72w, Adon, Campbell County, Wyoming, in the center of the Powder River basin. This well is expected to be a small discovery in the Converse sand (Minnelusa) and casing has been perforated and the operator is now swabbing, with no tests reported.

New operations.—Nine new operations were reported, of which six were in Montana, one in Wyoming, one in Colorado, and one in Utah.

Completions.—Thirteen wells were completed during the week, of which 10 were oil wells, 1 was a gas well, and 2 were dry holes. Eight of the completions were in Montana, three in Colorado and two in Wyoming.

WILDCAT FAILURE IN MONTANA

Bannatyne, Teton County, Tom Carney 1 Speer, NW NW SE 5-25n-1e, TD 3,115 ft., Sunburst 1,310, Madison lime 1,505, Devonian 2,430 ft.; elev. 3,420 ft. gr., plugged and abandoned in granite.

TEXAS GULF COAST

New Cockfield Production Opened in Hardin County

HOUSTON.—New Cockfield production has been opened by American Republics Corp. in the extreme northeastern portion of Hardin County, approximately 4 miles northeast of Beach Creek field. The 1 C. M. Votaw-fee, discovery well of the new East Creek field, was drilled to 7,587 ft. with no shows of commercial value in the Wilcox. Hole was plugged back and completed in the Cockfield sands with top of the saturation at 6,410 ft. Pipe was perforated with 13 shots in a 2-ft. section from 6,417-19 ft. On a potential gage, the well flowed 178.60 bbl. of 39°-gravity oil, 2.3 per cent basic sediment and water, per day through a ⅛-in. choke. Flowing pressure on tubing was 1,100 psi. and gas-oil ratio 1,200. This well is located in the C. M. Votaw (H&TC) Survey, Section 200, Abstract 801, and is 4½ miles northwest of production in the Silsbee field. A new location has been staked, 1 H&TC fee-Section 199, ¾ mile west and a little north of the Votaw 1 discovery. It is projected to a depth of 7,600 ft.

Standard Oil Co. of Texas 1 J. S. Peters et al, third well in the Gist discovery area of Newton County, is being tested for production in the Hackberry sands. Total depth is 7,255 ft. and 7-in. pipe is cemented at 7,253 ft. Perforations were made at 7,196-97 ft. and on a 17½-hour drill-stem test, the well flowed at the rate of 224 bbl. of oil per day with 1,050 psi. pressure while flowing. Gas ratio was 560. If successfully completed here, it will be the third well for the field with each producing from different levels. The discovery, Hankamer 1, flows oil from 5,743-45 ft., the confirmation, Hartbert 1, from 5,617-19½ ft. Derrick is up on the B. E. Quinn et al 1, north offset to the Hartbert well, but operations will not be started until the Peters well is completed.

Pan American Production Co. 1 W. S. Munson, wildcat exploration in the Bailey's Prairie area of Brazoria County, is being drilled ahead below 5½-in. pipe setting at 11,695 ft. Hole was drilled below 10,775 ft. at last reports and was scheduled to go to the 12,000-ft. level.

Eighteen new locations were reported this week, nine of which are wildcat starts, two each in Chambers and Wharton and one each in Austin, Brazoria, Hardin, Matagorda, and San Jacinto counties. One successful wildcat was completed, opening the East Beach Creek field in Hardin County, and two wildcats in Harris County were completed dry.

GULF COAST TEXAS (DISTRICTS 2 AND 3) SUCCESSFUL WILDCAT)

Hardin County: New oil pool East Beach Creek—American Republics Corp. 1 C. M. Votaw-fee, in C. M. Votaw (H&TC) Sur., Sec. 200, 4½ mi. N-NW of Silsbee field, TD 7,587 ft., top sand 6,410 ft., Cockfield, perforations 6,417-19 ft., IP: 179 bbl. oil per day through ⅛-in. choke, GOR 1,299, TP 1,100 psi., gravity 39°, 2.3 per cent b.s. and w.

GULF COAST TEXAS (DISTRICTS 2 AND 3) WILDCAT FAILURES

Bee County: Bridwell Oil Co. 1 M. J. White, in Refugio Co. School Land Sur., 3½ mi. NW of Tynan, dry, TD 4,716 ft.

DeWitt County: The Texas Co. 1 Edward A. Kolodzey, in Dolores Aldrete Grant, 5.3 mi. SE of Nordheim, dry, TD 8,500 ft.

Lavaca County: Forest Oil Corp. 1 Stella Woytek et al, in James Campbell League 2, 3 mi. NE of Hallettsville, dry, TD 8,008 ft.

Live Oak County: H. E. Dirks and B. P. Wood 1 B. P. Wood, in BS&F Sur. 35, 10 mi. NE of Geo. West, dry, TD 4,360 ft.

Harris County: L. M. Josey 1 Dr. C. S. Nelson, H&TC Sur., 3½ mi. SW of Cypress townsite, 3 mi. NW of Ogburn oil production, dry, TD 7,528 ft.

Wright Drilling Co. 1 Seaside Realty Corp., in J. Hunter Sur., 2 mi. north of LaPorte townsite, try, TD 8,387 ft.

APPALACHIAN FIELD

Columbian Carbon to Drill Wildcat in West Virginia

PITTSBURGH.—The customary holiday shut down to permit field crews to get home prevailed throughout the area with a resultant few completions and little work progress in the wildcat list. One new location listed in West Virginia will be an interesting wildcat. In Cologne district, Mason County, Columbian Carbon Co. will drill on the Goldie Ankrum et al farm which, located on the Ravenswood Quad, is 0.22 mile south 38 degrees 50 minutes and 2.72 miles west 81 degrees 50 minutes starting at an elevation of 671.3 ft.

New locations in addition to the above totaled 14 and in Crook, Scott and Sherman districts, Boone County: Jefferson and Laural Hill districts, Lincoln County; Ravenswood district, Jackson County; Chapmanville and Logan districts, Logan County; Clear Fork and Trap Hill districts, Raleigh County; Grant district, Wayne County; Oceana district, Wyoming County.

In southwest Pennsylvania, new locations totaled five and in Red Bank, South Buffalo and Wayne townships, Armstrong County; Beaver Township, Jefferson County; Allegheny Township, Westmoreland County.

SOUTHWEST PENNSYLVANIA WILDCAT FAILURES

Fayette County, Georges Township: Fox Bros. 1 Bert & Ray Thomas, dry, Injun sand, TD 1,350 ft.

Westmoreland County, Bell Township: Peoples Natural Gas Co. 1 John D. Kissell, dry, Tiona, TD 3,302 ft.

WEST VIRGINIA SUCCESSFUL WILDCATS

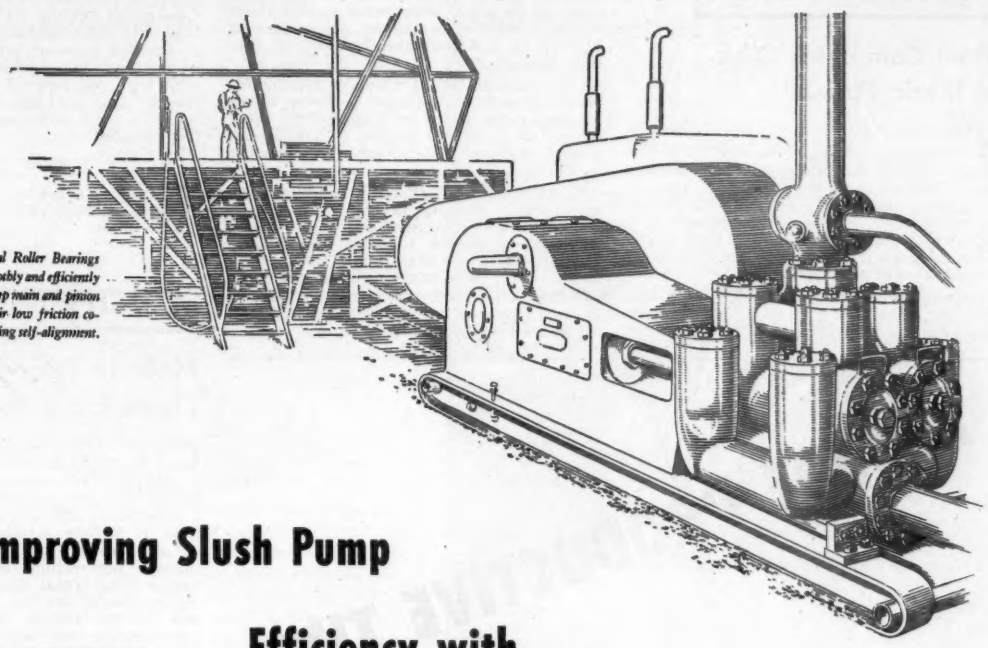
Knawha County, Elk district: United Fuel Gas Co. 6,239 Payne Gallatin Mining Co., 1,220,000 cu. ft. gas, after shot, elev. 1,045 ft., Corniferous lime 5,319 ft., Oriskany 5,450 78 ft., TD 5,521 ft.

United Fuel Gas Co. 6,242 W. J. Patterson, 7,117,000 cu. ft. gas, after shot, elev. 789 ft., Corniferous lime 4,969 ft., TD 5,115 ft.

WEST VIRGINIA WILDCAT FAILURES

Doddridge County, Cove district: Prospect Motors, Inc. 1 Frederick Bode Hrs., dry, Gordon sand, TD 2,790 ft.

Wyoming County, Oceana district: Hope Natural Gas Co. 9,147 A. A. Lilly, dry, Big lime 2,460-2,850 ft., Berea 3,415-3,440 ft., acidized, TD 3,446 ft.



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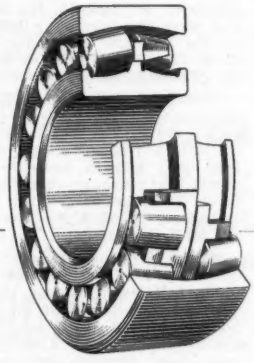

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SOUTH LOUISIANA

Shell Completes Oiler In Iberia Parish

NEW ORLEANS.—Shell Oil Co., Inc., has completed another good oiler at Weeks Island dome in Iberia Parish. The 4 Smith-State Unit 1, 13-14s-6e, gaged 439 bbl. of 34°-gravity oil daily through an 11/64-in. choke with 2,500 psi. flowing pressure on the tubing and a gas ratio of 1,040. Total depth is 13,060 ft., with production through perforations at 13,004-020 ft.

Magnolia Petroleum Co. 1 Four C. McPherson, wildcat exploration in Beauregard Parish, 5 miles east of Longville townsite and 8 miles northeast of Bear field, is coring ahead below 8,455 ft. Sand with shows of oil were cored from 8,415-45 ft. This test is located in the northwest quarter of the southeast quarter of Section 26-5s 8w.

Gulf Refining Co. 1 Cleobule Hernandez et al, wildcat in 18-10s-4e, is being tested through perforations at 12,032-048 ft. Total depth is 12,198 ft. where it hit a salt water flow and 5½-in. pipe is cemented at 12,198 ft.

Humble Oil & Refining Co. are drilling ahead after making several tests in its deep wildcat exploration out in Calcasieu Lake, Township 13 south, 9 west, Cameron Parish. The 1 State Lease 1256, drilled to a total depth of 14,225 ft., indicated some gas production and recovered 1,350 ft. of gas-cut mud on test from 13,993-14,002 ft. Another test through perforations at 13,670-678 ft., made a full salt water recovery. The 7-in. pipe is cemented at 14,018 ft.

Barnsdall Oil Co. 8-B Long Bell, 6-6s-9w, Longville field, Beauregard Parish, flowed a potential gage of 195 bbl. of 49.3° gravity oil per day through a 9/64-in. choke with 1,475 psi. flowing pressure on tubing. Gas-oil ratio of 1,723. Total depth is 8,280 ft. with pipe perforated from 8,176-90 ft. for completion.

Six new locations were reported this week, four being wildcats, one each in Avoyelles, Evangeline, Livingston and Terrebonne parishes. All completions were in proven areas.

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SOUTHWEST TEXAS

McBride Discovery Well Flows 3 to 4 Bbl. Hourly

CORPUS CHRISTI.—W. C. McBride et al 1-B Stockton, new oil field discovery in northwestern Goliad County, approximately 2 miles southwest of Charco and 3 miles north northeast of the Hord's Creek field, is flowing at the rate of 3 to 4 bbl. of pipe-line oil per hour on initial test through perforations at 4,590-95 ft. in the Yegua zone. Total depth is 8,511 ft. with 5½-in. casing set to 7,685 ft. Production test in the Luling sand of the Wilcox zone yielded only salt water through perforations at 7,606-18 ft. The Slick sand also showed water on a test at 7,456-61 ft., as did also the Mackhank sand at 7,702-12 ft. The Pettus sand in this well showed for gas-condensate production at 3,988-95 ft.

Brown & Wheeler 1-A Kauffmann, new pay zone discovery at Hord's Creek field, gaged 80 bbl. of 48°-gravity oil per day through a 7/64-in. choke, tubing pressure 1,080 psi., shut-in pressure 1,580 psi., on initial test through perforations at 5,062-72 ft. Total depth is 5,148 ft., with 5½-in. casing set at 5,148 ft. Operators are waiting on potential gage.

Rowan & Hope 6 Sally Ragsdale, new discovery at "Jamie" field' in south portion of Valentin Garcia Grant, 1½ miles northeast of East Telferner field and 4½ miles south of Inez, in Victoria County, gaged 57,000,000 cu. ft. of gas per day on open flow, through perforations at 5,102-08 ft. Total depth is 5,348 ft., with 5½-in. cemented at 5,130 ft. Shut in pressure is 2,050 psi.

P. R. Rutherford et al 2 J. F. Welder Heirs, wildcat test in Refugio County, approximately 3½ miles northwest of Vidauri, has set casing after running electrical log to the total depth of 6,409 ft. Some sand with oil saturation was recovered, and attempt will be made to complete oil production. This well is in the James Power and James Hewitson Survey.

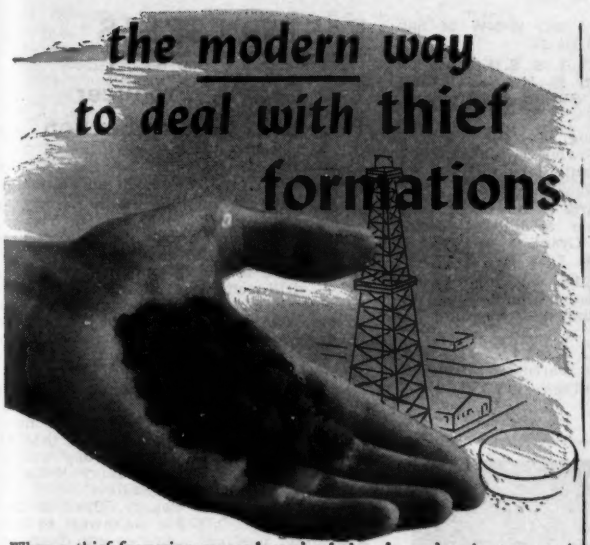
Mills Bennett 1 C. E. Hall, ½ mile east-northeast extension at West Cosden-Mackhank field, in Bee County, flowed 116 bbl. of 33.5°-gravity oil per day through 3/16-in. choke, on potential gage. Production is through perforations at 7,450-54 ft.

There were 21 new locations in Districts 1 and 2, with 7 being wildcats, 1 each in Bexar, Calhoun, Gonzales, Karnes, Medina, Milam, and Refugio counties. District 4 received 20 locations, 3 being wildcats, 1 each in Duval, Starr and Webb counties. Three wildcat failures in District 1, one each in Frio, Medina, and Zavala, while 4 were failures in District 2, one each in Bee, DeWitt, Lavaca, and Live Oak counties. District 4 received one successful wildcat completion to open a new gas pool in Starr County, while six were dry, three in Jim Hogg and one each in Duval, Starr and Willacy counties.

SOUTHWEST TEXAS (DISTRICT 1) WILDCAT FAILURES

Frio County: Magnolia Pet. Co. 1 H. L. Smith, in O. C. Smith Sur., 6 mi. NE of Pearsall, dry, TD 3,780 ft.

the modern way to deal with thief formations



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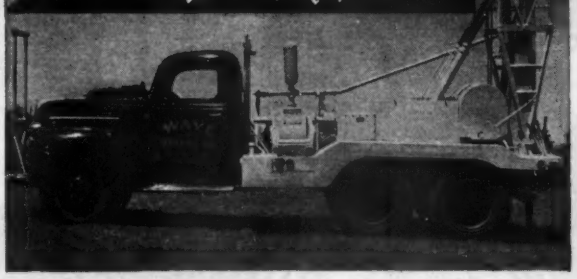

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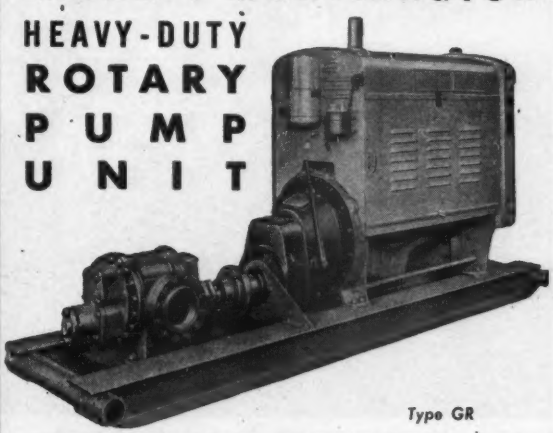

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NEW ORLEANS HOUSTON DALLAS

Medina County: Ralph E. Fair, Inc., 1 Mame M. Adams, in John G. Durst Sur. 14, 4.8 mi. NE of Yancey, dry, TD 1,280 ft.

Zavala County: The Texas Co. 1 A. B. Spencer, Jr. unit, Del Monte area, in P. J. Aguirre Sur., 2 mi. NE of Del Monte field, dry, TD 3,803 ft.

SOUTHWEST TEXAS (DISTRICT 4) SUCCESSFUL WILDCATS

Starr County: New gas pool—W. B. Jewel Osborn and Mid-Continent Pet. Corp. 2 John Clopton, in Tract 5, Evans Subd., in south part of Porcion 86, 7 mi. SE of Rio Grande City, top pay 629 ft., TD 4,006 ft., perf. 629-37 ft., IP: 391,000 cu. ft. gas per day through ¼-in. choke (dry gas), TP 265 psi., shut-in pressure 295 psi., no water.

SOUTHWEST TEXAS (DISTRICT 4) WILDCAT FAILURES

Duval County: Taylor Refg. Co. 8-A Parr, BS&F Sur. 303, 4 mi. W-NW of San Diego, dry, TD 5,404 ft.

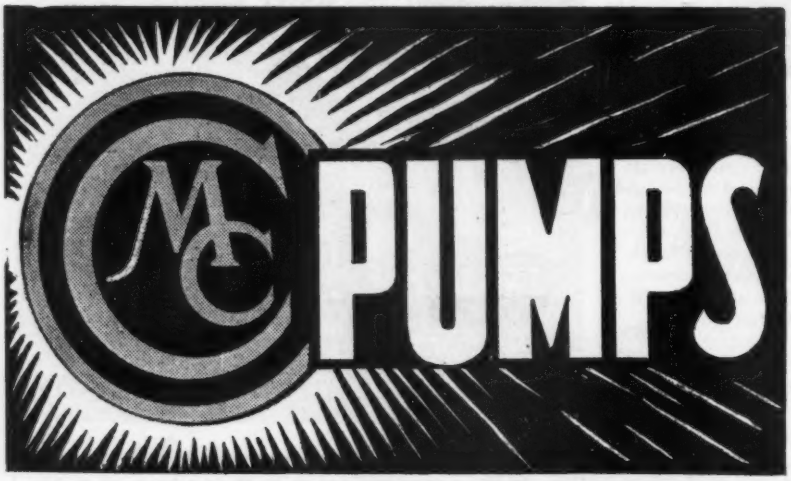
Jim Hogg County: C. B. & S. Exploration Co. 1 S. K. East, in Mrs. E. Tribble Sur. 619, 14 mi. SW of Hebbronville, dry, TD 4,515 ft.

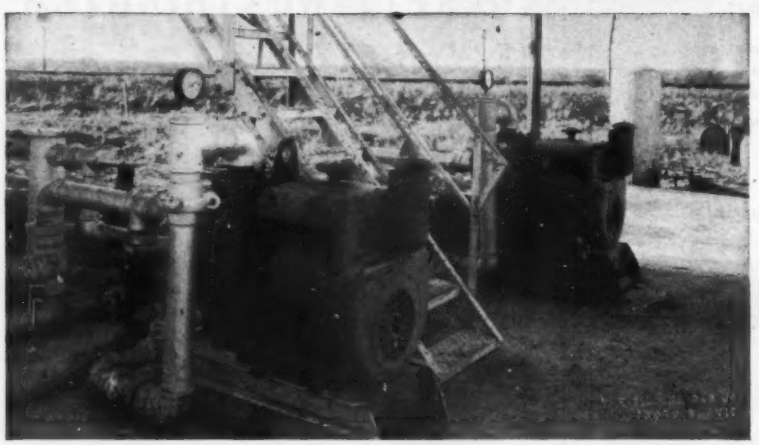
Humble Oil & Refg. Co. 2-F Mestena O. & G. Co., in Fowler & Rankin Subd. of El Sordo Grant, 10¼ mi. SW of Hebbronville, dry, TD 4,356 ft.

Killam & Blanchard 3 Downs Royalty Corp., O. N. Beer & Millard Coffey Subd., El Javali Grant, 5 mi. SW of Cuevitas, dry, TD 2,616 ft.

Starr County: Baldridge & King et al 2 Mrs. O. H. Davenport-State, Sur. 280, 2½ mi. E of Rincon field, dry, TD 8,515 ft.

Willacy County: H. L. Hunt 1 C. E. Wertz, in San Juan de Carricitos Grant, 1 mi. E of Raymondville, dry, TD 11,053 ft.





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EASTERN TEXAS

Low-Gravity Producer Found in Paluxy Section

DALLAS.—Low-gravity oil pay in the Paluxy section has been added to the Chapel Hill gas field of Smith County at Chapel Hill Gas System's 2 J. B. Yancey, John Dillard Survey, 14 miles southeast of Tyler. It topped the sand at 5,592 ft., on an elevation of 521 ft., and drilled to 5,615 ft. A drill-stem test between 5,594-5,615 ft., with ¼-in. choke on bottom and open at top, recovered 12 bbl. of 17°-gravity oil, with no water, on a bottom-hole flowing pressure of 625 psi. Shut-in bottom-hole pressure rose to 2,175 psi. in 10 minutes. Operators installed pump and completed for an initial production of 225 bbl. of oil a day. The well was said to have slopped over, without artificial lift, at the rate of 15 bbl. of oil a day during preliminary tests. Other Paluxy wells in the field produce gas distillate.

In San Augustine County, Byrd & Delaney 1 Blount, 4 miles southwest of San Augustine, was preparing to run tests on perforations in the Pettit limestone at 8,741-99 ft., which had previously shown for gas distillate production.

In the Tri-Cities field of Henderson County, W. B. Hinton 1 Evans had applied to the Railroad Commission for permit to make a dual completion. If dually completed, it will open a new pay zone in the Travis Peak, found between 8,609-8,728 ft. The well is now producing from the Bacon limestone at 7,744-7,804 ft., in which it made a daily potential of 16,000,000 cu. ft. of gas, plus 50 bbl. of 68.9°-gravity oil per 1,000,000 cu. ft. of gas. In testing the Travis Peak zone, packer was run to 8,608 ft.; 1,500 ft. of water cushion was used, and ¼-in. chokes. It started flowing immediately, with gas to the surface in 5 minutes. After recovering the water cushion, flowing pressure was 1,100 psi. Shut-in tubing pressure rose to 3,200 psi. in 1½ hours. When reopened, the flowing pressure leveled off at 1,250 psi., making gas and an estimated 20 to 30 bbl. of distillate per 1,000,000 cu. ft. of gas.

Rig and tools were being moved in last week to the site of Humble Oil & Refining Co. 1-C Pickering Lumber Co., an 8,300-ft. Travis Peak test in southeastern Shelby County. Location is on a 584-acre lease in the James Rowe Survey, about 2 miles east of Patroon.

In Anderson County, unconfirmed reports said the Pettit zone apparently has been reached at The Texas Co. 1 Broadway. Operators had reached 8,743 ft. and were to make two more cores before testing.

EAST TEXAS (DISTRICTS 5 AND 6) SUCCESSFUL WILDCATS

Cherokee County: General Crude Oil Co. 1 J. W. Summers et al, John Hunt Sur., 9 mi. SW Rusk, flowed 115.28 bbl. of 41.7°-gravity oil a day, 3/16-in. choke, Woodbine 5,133-36 ft., TD, tubing pressure 460 psi., casing pressure 775 psi., GOR 528 cu. ft., elev. 344 ft.

Wise County: Cities Service Oil Co. 1 B. O. Manning et al, 4,900 ft. from south line, 330 ft. from west line, J. Tarleton Sur., A-825, 2 mi. W Chico, perforated 5,203-35 ft. in Caddo limestone, topped 5,086 ft., flowed 295 bbl. in 19 hours through ¾-in. choke, potential flowed 164 bbl. oil a day, 12/64-in. choke, 41.8°-gravity oil, GOR 590 cu. ft., TD 7,052 ft., elev. 905 ft.

EAST TEXAS (DISTRICTS 5 AND 6) WILDCAT FAILURES

Hopkins County: Standard Oil Co. of Texas 1 H. J. Cox, Simon Derrick Sur., 1½ mi. NW Peerless, dry, TD 4,778 ft., Nacatoch 418 ft., Pecan 1,330 ft., chalk 2,645 ft., Eagleford 2,902 ft., Woodbine 3,110 ft., Comanche 3,750 ft., Georgetown 3,880 ft., Paluxy 4,580 ft., elev. 550 ft.

Van Zandt County: J. M. DuePree, Jr. 2

B. W. Bruce, Jr., W. H. Matthews Sur., 6 mi. S Wills Point and 660 ft. of 1 Bruce, dry, TD 5,883 ft., Pecan 2,040 ft., Austin 2,890 ft., Woodbine 3,830-4,580 ft., Paluxy 5,645 ft., by samples; logged Woodbine 3,865-4,605 ft., Goodland 5,558 ft., elev. 454 ft.

Wood County: Bobby Manziel 1 J. C. Gilbreath, Berry Smith Sur., 9 mi. NE Quitman, dry, TD 4,200 ft., sub-Clarksville 4,136 ft.

N. CENTRAL TEXAS

West Montague County Gets New Strawn Producer

WICHITA FALLS. — Western Montague County had new Strawn sand production this week at A. R. Dillard's 1-B Walker, Block 18, Limestone CSL, 3 miles north of the town of Stoneburg, and approximately the same distance south of the Benson field. At plugged-back total depth of 4,966 ft., operators set casing to 4,948 ft. and swabbed 90 bbl. of oil in 15 hours. A mechanical difficulty was said to have cut the oil recovery to some extent. This well had previously flowed oil on a drill-stem test from 4,962-72 ft. On the test, it recovered 820 ft. of oil in 30 minutes, with bottom-hole pressure of 2,025 psi.

One mile southwest of Montague, Sinclair Priarie Oil Co. et al 1 Gronow, in the L. F. Fisch Survey, was preparing to install pump, after swabbing 104 bbl. of oil in 24 hours through perforations between 4,079-89 ft. It is a Strawn sand discovery.

In Throckmorton County, Caddo limestone production was extended ½ mile northwest of the Magnolia-Graham area by Russell Maguire and Prairie Oil & Gas Co. of Texas 1 Latham, Block 986, TE&L Survey. The well flowed 395 bbl. of 42°-gravity oil in 20 hours, through 1/32-in. tubing choke, from pay at 3,895-3,903 ft. Location is on a farmout from Fred M. Manning, Inc.

Fred M. Manning, Inc. 1-F Parrott, Block 968, TE&L Survey, opened the first Mississippi limestone production in the Manning-Atkinson (Caddo limestone) field. Location is approximately 1 mile southeast of nearest production in the field, and the new well may be classed as a discovery. While no gage had been reported, the well kicked off to flow for a few minutes, after acid treatment between 4,518-27 ft. It was shut in for storage. Top of the Mississippian was 4,518 ft. There were no shows of oil in the Caddo.

Manning 8 McKnight, in the F. A. Richardson Survey, found production in the Mississippian, to open new production approximately 1 mile north of the McKnight Caddo limestone field, and 1½ miles east of the Howsley field, which produces from both the Mississippian and the Caddo. Some operators believed it might extend production from Howsley, since there are no dry holes between Howsley and the new producer. The 8 McKnight tentatively placed top of the Mississippian at 4,557 ft., with total depth at 4,577 ft., corrected to 4,588 ft. by electrical survey. A 55-minute drill-stem test between 4,577 ft. to total depth brought oil to the surface in 50 minutes, with bottom-hole pressure at 2,075 psi. in 15 minutes. The tool was closed and casing set to 4,568 ft. for completion tests. No estimate was made on the probable capacity of either of Manning's new wells.

Five miles northwest of Throckmorton, Manning's 1 McClusky was drilling below 5,225 ft. in limestone. It tentatively placed top of the Mississippian at 5,103 ft. A drill-stem test, open 1 hour, between 5,147-87 ft., recovered 15 ft. of mud, with no shows. It was also dry in the Caddo limestone. The same company's 1 W. R. Watt, 6 miles northwest of Throckmorton, was drilling below 3,875 ft.

Northwestern Comanche County had prospects of oil production from the Ran-

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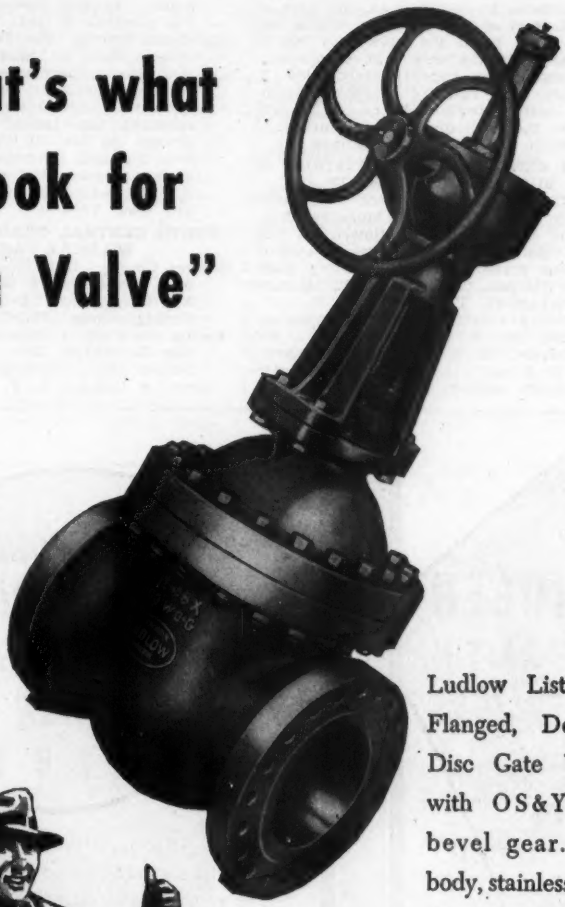

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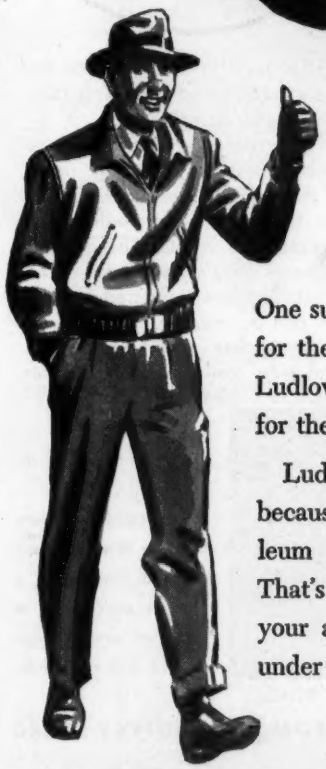

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ger limestone in the Gorman gas field at T. A. Kirk et al 1 S. D. Miers, which was said to have filled the hole with 600 ft. of oil after drilling only 6 in. of oil-bearing limestone at approximately 3,000 ft. Operators were running casing for completion tests. Location is on a 238-acre tract in the William DeMoss Survey, 3 miles south of the town of Gorman.

NORTH CENTRAL TEXAS (DISTRICT 9) SUCCESSFUL WILDCATS

Clay County: Mid-Continent Petroleum Corp. 1 J. J. Decker, T. Morehead Sur., 4 mi. SW Deer Creek, flowed 131 bbl. 42.8°-gravity oil in 18 hours, open 2-in. casing pressure 150 psi., tubing pressure 110 psi., GOR 380 cu. ft., oil sand 4,076-4,106 ft., TD.

Jack County: Cox Drilling Co. 1 Spearman Estate, Sec. 2, SPRR Sur., 9 mi. SW Antelope, flowed 25 bbl. 40°-gravity oil in 2 hours, 12/64-in. choke, Caddo limestone 4,814-30 ft., TD 4,029 ft., PB 5,004 ft., casing pressure 580 psi., tubing pressure 50 psi., GOR 400 cu. ft.

Montague County: The Texas Co. 1 D. B. Benson, Sec. 1, Limestone CSL, 4 mi. NW Bowie, perforated 6,236-44 ft. in Bend conglomerate, swabbed dry, loaded with water, treated with acid, swabbed five times and kicked off, flowed 100 bbl. oil in 1 hour, 144 bbl. first 3 hours, 154 bbl. second 3 hours, casing pressure 600 psi., tubing pressure 225 psi., GOR 1,040 cu. ft., gravity 40°, elev. 1,046 ft.

NORTH CENTRAL TEXAS (DISTRICT 9) WILDCAT FAILURES

Archer County: Dub Wood Drilling Co. 5 S. L. Scott, Sec. 2, BS&F Sur., 10 mi. NW Olney, dry, TD 1,236 ft. in shale, Gunsight lime 1,134 ft.

Fortex Oil Corp. 1 Wilson Properties "A," Blk. 56, ATNCL Sur., 3 mi. SW Huff Station, dry, TD 2,650 ft. in shale.

Grace & Grace 1 L. F. Wilson "D," Lot 3, Blk. 68, ATNCL Sur., 7 mi. N Archer City, dry, TD 4,730 ft., KMA lime 4,456 ft., Canyon 2,328-31 ft.

E. P. Griffin 1 R. Campbell, W. H. Fitchett Sur., 2½ mi. SW Anarene, dry, TD 1,230 ft., Gunsight 1,107-18 ft., dry sand 1,118-20 ft.

R. L. Mattingly 1 A. L. Abercrombie, W. S. Blount Sur., 5 mi. N Megargel, dry, TD 1,435 ft. in sand.

C. W. and Wm. L. Snoddy 1 J. H. Turbeville, Blk. 58, Jefferson CSL Sur., 1½ mi. NE Anarene, dry, TD 1,232 ft. in shale, Gunsight lime 1,111 ft.

Cooke County: H. L. Nutting 1 Mary Gwynn, J. Jennings Sur., 4 mi. E Myra, dry, TD 1,627 ft., in limestone.

F. B. Paine Drilling Co. 1 H. C. Hay, Chas. Wheelock Sur., 2 mi. S Gainsville, dry, TD 3,084 ft., no tops reported.

W. F. Russell 1 Amanda Parker, BBB&C Sur., 3 mi. S Myra, dry, TD 1,585 ft., bailed some oil from shale 1,559-69 ft.

Jack County: C. J. Bohner et al 1 Edna Fry, Manson Shield Sur., dry, TD 625 ft. in sand.

Montague County: A. R. Dillard 1 Mrs. Alice Monroe, F. Secrest Sur., 13 mi. NW St. Jo, dry, TD 3,455 ft., sand 3,130 ft., no shows.

Wichita County: T. A. Norwood 1 J. A. Moore, Blk. 45, Red River Valley Lands, 3½ mi. W Burkburnett, dry, TD 2,205 ft. in shale.

Young County: Nu-Enamel Oil Corp. 1 Oran Rogers, Sec. 256, TE&L Sur., 6 mi. SE Olney, dry, TD 2,940 ft. in sand, show of oil in sand 2,620-23 ft.

Reno Oil Co. et al 1 H. W. Schlittler, J. Johnson Sur., 4 mi. NE Graham, dry, TD 4,855 ft., Caddo 3,948 ft., show oil 4,048 ft., Mississippi 4,807-55 ft., elev. 1,205 ft.

WEST CENTRAL TEXAS (DISTRICT 7-B) WILDCAT FAILURES

Coleman County: Hughes Drilling Co. 1 M. D. Taylor, Sec. 704, T. B. Frazzell Sur., 4 mi. NW Coleman, dry, TD 3,508 ft., Home Creek 1,890 ft., lower Capps 2,635 ft., lower Fry sand 2,660-80 ft., Caddo 3,160 ft., elev. 1,861 ft.

Haskell County: Pan American Producing Co. 1 J. M. Cannon, Sec. 92, H&TC Sur., 2 mi. N Stamford, dry, TD 5,546 ft., Reef limestone 2,943 ft., Ellenburger 5,418 ft.

Jones County: C. Andrade and A. G. Hansbro 1 L. D. Gahan et al, Sec. 27, Blk. 15, T&P Sur., 4 mi. NE Hawley, dry, TD 2,243 ft., coal 2,241-43 ft., no shows.

Shackelford County: Don Knight 1 W. D. Baker, T. W. Wright Sur., 5½ mi. SE Lueders, dry, TD 1,708 ft.

Throckmorton County: Paul B. Scott 1 J. B. Matthews, Blk. 47, Comanche Indian Reservation, 8 mi. SW Throckmorton, dry, TD 799 ft. in water sand.

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MISSISSIPPI

New Field Opened In Wayne County

JACKSON.—A new field has been opened in Wayne County by Hughes & Sistrunk 1 G. M. & O. R.R. Co., 24-9n-8w. After all porous zones in the Morrison, City Bank, and Stanley sands had been perforated, a pumping unit was installed and well was completed for an initial production gage of 183 bbl. of 19.5° gravity oil in 24 hours, with 2 to 20 per cent basic sediment and water. Total depth is 5,152 ft., and perforations are as follows: 4,966-73 ft., 5,011-18 ft., 5,039-55½ ft., 5,069-83 ft., 5,116-29 ft., and 5,141-51 ft. Tops as follows: Morrison sand 4,962-76 ft., City Bank sand 5,037-94 ft., and Stanley sand 5,113-20 ft.

Gulf Refining Co. 1 L. L. Majors, 29-6n-11w, Jones County, Ovett field discovery well, is installing pumping unit. The well continues to flow at an average rate of 101 bbl. of oil per day through ¼-in. tubing choke, with 85 psi. tubing pressure and zero casing pressure.

Also at Ovett, Gulf 1 B. L. Sholar, 30-

6n-11w, has recovered stuck drill stem and is now drilling ahead below 8,200 ft. in the Marine Tuscaloosa.

Three new wildcat locations were reported this week, one each in Perry, Union and Yazoo counties. Cranfield field, Adams County, received two new starts, while La Grange field, also in Adams County, received only one. A new oil pool for Wayne County was opened this week, while one wildcat was completed dry in Issaquena County. Four development wells were completed.

MISSISSIPPI SUCCESSFUL WILDCAT

Wayne County: New oil pool—J. W. Hughes & W. E. Sistrunk 1 G. M. & O. R.R. Co., 24-9n-8w, TD 5,152 ft., IP: pumped 183 bbl. oil per day, 19.9° gravity, perforations 4,966-73 ft., 5,011-18 ft., 5,039-55½ ft., 5,069-83 ft., 5,116-29 ft., and 5,141-51 ft. Electric log tops: Eutaw 4,950 ft., Morrison sand 4,962-76 ft., (fair porosity), City Bank sand 5,037-94 ft., (33 ft. shaly to fair porosity), Stanley sand (porous 5,113-20 ft.)

MISSISSIPPI WILDCAT FAILURE

Issaquena County: The Carter Oil Co. 1 Jane Heath, 19-10n-8w, dry, TD 4,087 ft. Tops as follows: Wilcox 1,917 ft., Midway 3,030 ft., chalk 3,447 ft., Glen Rose 3,474 ft., Igneous Sill 3,511-40 ft., Massive anhydrite 4,036-62 ft.

OHIO, KENTUCKY

Sayre Well Reports Gas

COLUMBUS.—In the southwest part of the Sayre pool, Walter Linkhorn et al 2 Mary Monahan, Section 33, Pleasant Township, Perry County, found 700,000 cu. ft. of gas in Clinton sand and nothing in Medina sand. The Clinton was logged at 3,712-59 ft., and the Medina at 3,827-32 ft. After plugging back to 3,759 ft., the Clinton was shot and after 4 hours gaged 3,000,000 cu. ft. of gas with a rock pressure of 1,030 psi. An offset location, due east of this well, Altier Brothers 1 Mary Monahan found only gas shows in both the Clinton and Medina, and may be drilled deeper to test the Sub-Trenton.

Another ¼-mile north extension to the Clayton field was completed by the Mid-East Oil Co. on R. E. Beard, Section 32, Madison Township, Perry County. Clinton sand at 3,320-58 ft. was shot with 60 qt. and flowed 61 bbl. in the first 24 hours.

John Morrow et al extended their gas pool on Irish Ridge ¼ mile to the west. The completion, 1 Mary V. German, Section 19, Brush Creek Township, Muskingum County, reported the Clinton at 4,080-4,102 ft. with a natural gage of 1,450,000 cu. ft.

A south extension of nearly 1½ miles to the gas pool in the north end of Bethlehem Township, Starks County, was completed by M. P. Belden et al on Jas. Pettigrew in Section 10. Clinton at 4,460-4,520 ft. gaged 290,000 cu. ft. of gas natural and 1,250,000 cu. ft. when shut in the casing after shot. Another well ½ mile to the south is expected to start soon.

In the Hemlock Grove pool in Bedford Township, Meigs County, H. B. Walker et al 4 Smith-Nelson, Section 2, gaged 511,000 cu. ft. of gas natural. Berea sand, topped at 1,624 ft., was drilled to 1,639 ft. At the south tip of the pool, Nollem Oil 5 Waid Bing, Section 1, Made 40 bbl. after shot, with the Berea reported at 1,661-78 ft.

Lorain, Muskingum, Monroe and Perry counties each have two new locations; Summit, Coshocton and Washington counties have one each. Ashland field led in completions with 8 out of a total of 23.

OHIO SUCCESSFUL WILDCATS

Summit County, Northampton Township: Wiser Oil 1 J. G. McCready, Lot 3, Clinton 3,565-3,620 ft., 215,000 cu. ft. of gas, TD 3,645 ft. (field extension).

WESTERN KENTUCKY

OWENSBORO.—Sun Oil Co. 1 Sarah Cox Keckley et al, wildcat in 5-L-26, Hopkins County, is dry and abandoned. Test was drilled to total depth of 3,182 ft. and small show of oil was recorded in Hardinsburg sand at 2,593-2,610 ft. and Cypress at 2,802-15 ft.

Ashland-Basin-Yunker 1 Crafton, wildcat in 9-O-24, Henderson County, is cleaning out after 40-qt. shot in Tar Springs at 1,762-90 ft.

INDIANA

EVANSVILLE.—C. E. O'Neal and Fisher Oil Co. 1 W. L. Hanning, wildcat in W½ E½ NE NW 1-6s-11w, 1 mile northeast of Evansville pool, Vanderburgh County, is showing for small producer. Test had good show of free oil in Pennsylvania sand at 886-98 ft. and is being shot.

Sun Oil Co. 1 Richardson-Page Unit, wildcat in SE SE NW 10-7n-7w, Green County, is testing gas in Devonian at 1,856-64 ft. and 1,912-20 ft. Total depth is 3,267 ft.

LA.-ARK.

Arkansas Fuel Applies For Dual Completion

SHREVEPORT. — Arkansas Fuel Oil Co. last week applied to the state conservation commission for permit to dually complete its 8-B W. E. DeLoach, southern section of the Haynesville field, Claiborne Parish, in 22-23n-8w, from both the "A" and "B" zones of the Smackover limestone. If granted, it will be the first such completion; previous wells having been completed from one or the other of the two zones.

Potential test of the "A" zone indicated

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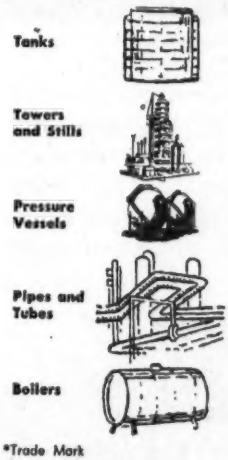

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a daily flowing rate of 414 bbl. of 42° gravity oil. It was gaged through 16/34 in. choke, with a gas-oil ratio of 11,090 cu. ft. Tubing pressure was 2,100 psi., and casing pressure was 800 psi. Production was from perforations between 10,050-10,090 ft.

State potential was also made on the "B" zone, from 10,147 10,300 ft., which flowed at the rate of 247 bbl. of oil a day through 14/64-in. choke, accompanied by some 2,000,000 cu. ft. of gas a day. Casing was packed off, and tubing pressure gaged 2,200 psi.

In Ouahita County, Arkansas, Lee & Burnett completed the 1 W. M. Smelser, NE SE NW 33-15s-19w, as a ½-mile extension to the Wesson field. The test was considered a semiwildcat, in an inactive area. Perforations in the Hogg sand were between 3,164-74 ft., and the well was swabbed in. No estimate was given on the estimated production but observers thought it should make the field's allowable of some 10 bbl. per acre, on the pump. Electric log was said to have shown 24 ft. of saturation, an increase over the nearest producer. The same operators were rigging up the 2 Smelser as a north offset in the SE NE NW of the same section.

NORTH LOUISIANA WILDCAT FAILURES

Grant Parish: E. F. McGee 1 McGee-Johnson, SE NW SW 24-7n-2w, dry, TD 4,045 ft., Wilcox 2,730 ft., by samples, elev. 191 ft.

Natchitoches Parish: Southern Producing Co. 1 Louisiana Long Leaf Lumber Co., NW NW 11-8n-8w, dry, TD 7,816 ft., Wilcox 1,716 ft., Midway 2,620 ft., chalk 3,089 ft., gas rock 3,082-87 ft., elev. 95 ft.

Union Parish: Howard M. Jones 1 Ritchie Grocery Co., SW SW SE 10-23n-1w, dry, TD 2,255 ft.

ARKANSAS SUCCESSFUL WILDCAT

Calhoun County: Houston Oil Co. 1 H. B. Gaughan, SW SW NE 34-13s-16w, pumped 25 bbl. of 15.9°-gravity oil per day from Meakin sand at 1,990-2,003 ft., TD 2,048 ft., elev. 103 ft.

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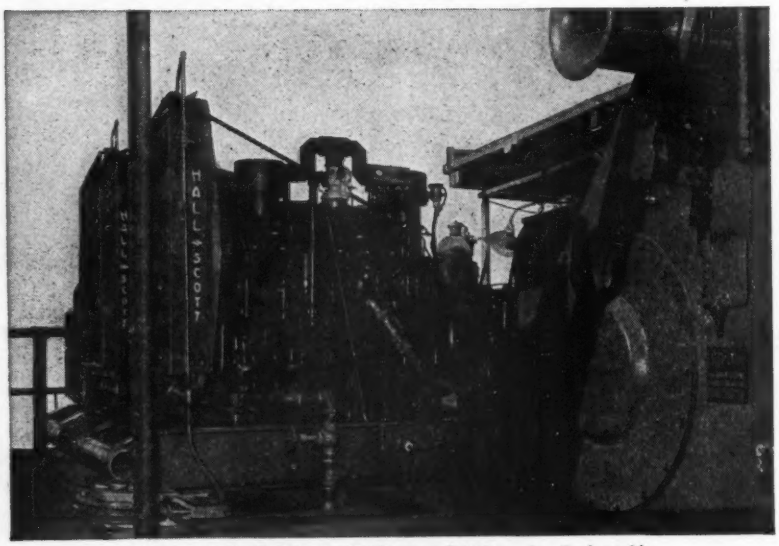

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KANSAS

Williams Hits Pay Near Kowalsky Pool

ROBERT L. WILLIAMS 1 Soeken, SE SE SW 30-20-11, wildcat between Kowalsky and Silica pools, has hit pay in Arbuckle lime at 3,381 ft. On 30-minute drill-stem test at 3,381-94 ft., recovery was 300 ft. of 47-gravity oil with no water. Test is ¾ mile northwest of Kowalsky pool and 1 mile from Silica pool. Williams has 560 acres under lease in vicinity.

M. B. Armer and John Lindas 1 Hammeke, NW NW SE 21-21-12, is opening new Arbuckle pool 1 mile east of Mueller pool, northern Stafford County. Hole filled up with 1,000 ft. of oil in 1 hour and swabbed 72 bbl. in 13 hours from 3,575 ft.

Stanolind Oil & Gas 1 Wheatley, prospective discovery 15 miles northeast of Liberal, Seward County, and 12 miles east of Hugoton gas field, is to be acidized in upper section of Mississippi lime. Test swabbed 10.7 bbl. of oil and 4.6 bbl. of water per hour from perforations at 5,865-90 and 5,910-20 ft. At 5,810-40 ft. through 12 perforations, well swabbed 9 bbl. of fluid for 9½ hours with 34 per cent water and good show of gas. This is the interval to be acidized.

Drillers Gas Co. 1 Slease, CNL NE NW 11-27-1w, west offset to same operator's 1 Rombach which recently opened a new Kansas City lime pool on edge of northwest city limits of Wichita, is showing for a 200-bbl. well. Production is from perforations at 2,708-15 ft. The pool opener was rated at 72 bbl. Operators have started on north offset, the 1 Pritchard, CSL SW SE 2-27-1w.

The Christmas season saw a letdown in activity with 26 new locations and 46 completions announced for week. Barton County led the activity with 5 new locations and 12 completions. Other leaders were Rice and Ellis.

OKLAHOMA

Second Well Showing In Revived Papoose Pool

GAS & OIL INDUSTRIES, INC., has a second well showing in revived Papoose field of Hughes County at its 2 Thompson, C N½ NW NW 3-9n-9e. Test is offset to same operator's 1 Thompson which was completed in Booch sand a month ago. The 2 Thompson recovered 615 ft. of gassy oil-cut mud on drill-stem test of Cromwell sand at 3,284-3,322 ft. Papoose field produced for more than 20 years, but all wells were plugged and abandoned several years ago.

Stanolind Oil & Gas Co. is drilling ahead at its 1 Briscoe, wildcat in C NW SW 4-4n-5w, Grady County, which has possibilities of becoming the world's deepest producer. On 7-day test through drill-stem tester from 14,165-14,238 ft. in McLish sand, the production declined from 18 bbl. an hour initially to 9½ bbl. an hour on last day of test. Orders now are to drill through Oil Creek sand.

Carter Oil Co. 1 Woolridge, C SW NE 4-4n-3w, is showing for second producer in Southeast New Hope pool, Garvin County. On 19-hour test through perforations at 7,211-27 ft., well flowed 227 bbl. of oil through ½-in. choke.

Carter Oil Co. has abandoned its deep Love County wildcat northwest of Marietta after drilling below 9,000 ft. Company's 1 Carlton, C SE SE 30-6s-1e, was drilled to 9,010 ft. and electric log run before test was abandoned.

Cotton and Carter counties led in activity for week which saw 59 new locations and 62 completions throughout state. Cotton had seven locations and nine completions while Carter registered nine and six. Pontotoc and Stephens showed for seven and six new locations respectively.

OKLAHOMA WILDCAT FAILURES

Kingfisher County: Phillips and Carter 1 Cash, C NE NW 2-15n-5w, dry, TD 7,400 ft., Oswego 6,420 ft., Mississippian 6,746 ft., Woodford 7,052 ft., Hunton 7,101 ft., Sylvan 7,356 ft.

Love County: Allied Oil, Inc. 1 Levan, NE NE SW 11-7s-3e, dry, TD 3,365 ft., cherty lime 2,380 ft., shale with sand streaks 3,346-70 ft.

McClain County: Sinclair Prairie 1 Williams, C NW SW 18-5n-2w, dry, TD 7,662 ft., Layton 5,815 ft., oolitic 6,195 ft., sand 7,254-75 ft. with stain of oil, Hunton 7,396 ft., Sylvan 7,624 ft.

CALIFORNIA

Deepened Well Confirms Big Discovery

LOS ANGELES.—Recompletion of Standard of California's 73-30V, deep test on the Middle Dome of Kettleman Hills, 30-23s-19e, as a producer of substantial proportions, confirms assumptions that the company has made a major oil discovery in an Eocene sand. The well was brought in last week flowing 1,000 bbl. of 46°-gravity, practically clean, oil and 20,000,000 to 30,000,000 cu. ft. of gas through an 8/64-in. choke. The productive interval is between 12,072 ft. (top of the Eocene) and 12,280 ft.

Standard has been working on the well for over 2 years. It was originally drilled to 7,790 ft. by Petroleum Securities Co. in 1935. It produced a considerable quantity of distillate from the Temblor (Miocene) for a while, but died in a few months and was abandoned. Standard started deepening the well in September 1945, and drilled on down to 12,389 ft., bringing it in as an Eocene discovery in February 1946. It flowed several hundred barrels a day through a ½-in. choke for a few days, then water began coming in and it was killed. The water trouble plus the fact that there were about 2,000 ft. of drill pipe stuck in the bottom of the hole resulted in a decision to redrill, with the results stated above.

In connection with the discovery of oil in the Eocene on the Middle Dome at Kettleman Hills, it is interesting to note that the deepest horizon from which production is obtained on the prolific North Dome is the Avenal sand of Eocene age. The entire Eocene section has never been penetrated on the North Dome.

A new depth record for California has been established by Standard of California in its 1 Maxwell, 23-2n-23w, in the Montalvo area of Ventura County. The well, which is being drilled in an endeavor to extend production in a new oil area discovered near Montalvo early last year by Standard, is presently drilling below 17,250 ft., or less than 600 ft. from the world's depth record now held by Superior Oil Co.'s 51-11 Weller in Caddo County, Oklahoma, at 17,823 ft.

Texas Co.'s attempt to find oil 4 miles northwest of its recent discovery near San Ardo in Monterey County has ended in failure. The company's 1 Rosenberg Two, in 8-22s-10e, has been abandoned at 2,124 ft. after running electric log. Texas Co. discovered what appears to be a small, heavy oil field here several weeks ago.

Importance of the recent deep sand discovery by Shell Oil Co. on the southeast side of the Long Beach field in 29-4s-12w should be known in the next few weeks as several tests are nearing critical depths. First to reach the pay horizon has been General Petroleum Corp. 4 I.P.C., but swab-

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bing operations early this week have not provided much hope for a successful completion as recovery was mostly mud and water with only a trace of oil. Crew is now milling on drillable liner preparatory to going a little deeper.

CALIFORNIA WILDCAT FAILURES

Kern County, Cymric area: Corwin Drilling Co. 1, 8-29s-21e, dry, elev. 884 ft., TD 1,511 ft.

Butte County, Chico area: Superior Oil Co. 1 Elkhorn, 33-21n-1e, dry, elev. unknown, TD 2,280 ft.

Madera County, Mendota area: Jergins Oil Co. 1 Escarpedo, 32-14s-12e, dry, elev. 787 ft., TD 3,162 ft.

CANADIAN FIELDS

Possible Wet Gas Field Seen in Southern Alberta

CHATHAM.—Possibility of a wet-gas field in the southern Alberta foothills close to the Montana boundary is indicated by Canadian Gulf 1, LSD 15, 24-3-29w4, in the Pincher Creek district, which is reported to have encountered gas production in the top of the Madison limestone. The lime was encountered at 11,700 ft. and open hole drilled to 11,800 ft. when, following a survey, 7-in. casing was set at 11,755 ft., below which substantial porosity was indicated. When plug was drilled a gas flow, estimated between 5,000,000-10,000,000 cu. ft., forced 3,500 ft. of water out of the hole. The well was capped 8 minutes later. Possible naphtha content of the gas, or the presence of fluid, was not determined before the well was shut in. The well, drilled by the Alberta subsidiary of Gulf Oil Co., is the first of a number of deep tests in the Pincher Creek area to reach a conclusive depth in the Madison limestone, which is the productive horizon in Turner Valley. The production is the deepest yet encountered in Canada.

Leduc.—Imperial-Leduc 26, LSD 4, 22-50-26w4, is finishing in D-2 zone at 5,035-5,120 ft. as the company's twenty-third consecutive producer. A 62-minute drill-stem test of this section gave natural-gas flow at the rate of 500,000 cu. ft. daily, with crude oil reaching the well head in 35 minutes. Casing is being run and the well placed on restricted production. Imperial has three other wells nearing completion in the lime and four in shale with Imperial 31 starting in LSD 8, 26-50-26w4.

Home-Leduc 1, LSD 11, 21-50-26w4, bottoming at 5,345 ft., is a D-3 producer, drill-stem test for 1 hour showing 140 bbl. of clean oil, comparable with the largest producers in the field. Atlantic Oils 2, LSD 14, 23-50-26w4, has entered the D-3 zone below 5,000 ft. with a good producer indicated. Globe-Leduc West 4, LSD 15, 34-50-26w4, is coring below 4,969 ft., with early completion anticipated. The company has another well drilling, and three locations. East-Leduc 2, LSD 10, 5-51-25w4, below 4,192 ft., and Continental 1, LSD 2, 9-50-26w5, below 4,313 ft., are expected to finish early in January.

Central-Pyrcz 2, LSD 13, 25-50-26w4, testing a new area north of production, got the D-3 zone high at 5,136 ft., the same depth as Imperial 21, the highest logging producer, and is finishing below 5,200 ft. A producer at this point would considerably extend the proven field.

Imperial-Woodbend 1, LSD 5, 15-51-26w4, 3½ miles northwest of the nearest Leduc production, has entered the D-3 zone at depth comparable to the Leduc producers, and is making drill-stem test.

Dina.—In the Dina area, south of Lloydminster and close to the eastern Alberta boundary, Dinalta 1, LSD 10, 25-44-1w4, has finished in a 7-ft. sand with indications of a large producer. The horizon apparently corresponds to the Sparky sand of Lloydminster field, but is coarser and

the oil flowing more freely. The location is some 25 miles south of Lloydminster field in Alberta and 3 miles south of the Highwood-Dina 1 producer.

Lloydminster.—In the Alberta section, Imperial-H. B. Lloyd 1, LSD 5, 9-50-1w4, finished at 2,079 ft., has a large gas flow with considerable oil, and is being placed in steady production.

PERMIAN BASIN

Sun Completes Second Crinoidal Lime Producer

MIDLAND.—Sun Oil Co. completed its second Coke County Crinoidal limestone discovery this week for a daily potential of 447 bbl. of 48°-gravity oil. The second strike is 1 J. B. Walker, in the C. Brockhuysen Survey 526, about 4 miles southwest and across the Colorado River from Sun's Jameson field, which also produces from the Crinoidal. The 1 Walker made its potential, flowing through ¼-in. tubing choke from open hole between 6,230-50 ft. Gas-oil ratio was 1,201 cu. ft. Tubing pressure was 1,000 psi., and casing pressure was 1,475 psi.

In Ector County, on the north side of the Goldsmith Clear Fork field, Phillips Petroleum Co. completed its 2 Blakeney, Section 7, Block A, for a daily potential of 1,549.46 bbl. of oil a day, extending Ellenburger production 1¼ miles southeast of the new Frank Cowden Ellenburger pool. The 2 Blakeney was completed from open hole at 8,475-95 ft., and flowing through ½-in. choke. Gas-oil ratio was 683 cu. ft.

In Sterling County, 11½ miles northwest of Sterling City, Plymouth Oil Co. 1 Willie M. Foster, Section 56, Block 2, H&TC Survey, reported a recovery of 30 ft. of clean oil on a drill-stem test of the Strawn at 8,163-96 ft. Open 4½ hours, the wildcat had gas at the surface in 4 hours, and recovered 210 ft. of heavy oil and gas-cut mud, plus the 30 ft. of free oil in the bottom joint of pipe. The 1 Foster had top of the Strawn at 8,175 ft., on an elevation of 2,565 ft., or 5,610 ft. subsea. Plymouth's 1 Georgia Frost, ½ mile northeast of the Foster well, topped the Strawn at 8,210 ft., on an elevation of 2,604 ft., or 5,606 ft. subsea. The 1 Frost, which once indicated production from the Ellenburger, was last reported testing that formation at a plugged-back total depth of 8,364 ft.

In southern Hale County, Humble Oil & Refining Co. 1 J. A. Lutrick, Section 14, Block D-8, EL&RR Survey, 6½ miles northeast of Abernathy, reported a successful drill-stem test in the Pennsylvanian at 7,923-87 ft. This apparently was a correction of a previous reported drill-stem test between 7,920-80 ft. which was said to have unloaded fluid intermittently and recovering oil and gas-cut mud. The last report said gas came to the surface in 2 hours and 27 minutes, flowing at a pressure that varied between 525 and 825 psi., open, but the flow was not gaged and no estimates were made. In addition to the 270 ft. of clean oil, the recovery included 740 ft. of oil and gas-cut mud. Oil tested 42°-gravity. A 1,000-ft. water blanket was used. Humble's 1 Lutrick is approximately 6 miles west and 2 miles south of the Petersburg Wolfcamp discovery, which has had three offset dry holes.

In northern Reeves County, George P. Hill reported completion on two new Delaware sand producers in the Tunstill field, bringing the total number of wells to six. The 1 J. C. Camp, a diagonal northeast offset to the discovery well, flowed 193 bbl. of 41°-gravity oil, naturally, in 24 hours, on a gas-oil ratio of 450 cu. ft. The flow was made through 16/64-in. tubing choke, from open hole at 3,272-96 ft. The other completion was 1 Jack Tunstill, a west offset to Crouch and Texzona 1 M. E.

(Continued on page 119)

ILLINOIS

Clay County Wildcat Finds Oil in Cypress

MATTOON.—Calvert & Willis and Ashland Oil & Refining Co. B-1 Thomas Bemis, wildcat in SW SE NE 8-3n-8e, Clay County, has found good oil saturation in upper Cypress sand. On 1 hour drill-stem test, recovery was 150 ft. of gas, 270 ft. clean oil, 120 ft. oil-cut mud, and no water.

Latest pump test on Phillips Petroleum Co.'s successful wildcat 5 miles south of Fairfield, Wayne County, showed 189 bbl. of oil per day. Test is 1 Book, NW SE SW 31-2s-8e, and pay is McClosky lime at 3,375-85 ft.

ILLINOIS WILDCAT FAILURES

Christian County: Sun Oil Co. 1 Ettinger, SW SW SE 8-13n-1w, dry, TD 2,910 ft.

Coles County: Landon 1 Beard, SE SW NE 6-13n-8e, dry, TD 423 ft.

Edgar County: Farnham & Burkett 1 Thomas, NW NW SW 14-15n-14w, dry, TD 800 ft.

Marion County: Indiana Farm Bureau 1 Slovick, NE NE SW 21-4n-3e, dry, TD 2,270 ft.

Perry County: Mattern 1 Edgar, NE NE NW 36-6s-4w, dry, TD 1,565 ft.

Richland County: Dee Miller Drilling Co. 1 Ernst, NW SW NE 13-4n-14w, dry, TD 2,910 ft.

Calvert & Willis 1 Arterberry & Coen, NE SE NW 9-2n-10e, dry, TD 3,336 ft.

Wabash County: Sharp 1 Ceney, SE SW NW 32-1s-13w, dry, TD 2,932 ft.

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Jet Fuels for Aircraft

(Continued from page 55)

It is apparent that fuels of higher boiling point have greater heating values per gallon than aviation gasoline and also that aromatic type of fuels have greater heating value per gallon than either paraffinic and naphthenic fuels. Actual service tests between kerosine and aviation gasoline in a certain jet-powered aircraft have demonstrated that improvement in range is almost in direct proportion to the heating value. On the basis of increasing the range of aircraft, it might be advisable to have engines designed to utilize aromatic type of fuels with higher boiling points if possible.

Stability

Some preliminary gum studies indicate that the proposed methods of gum tests are not too well suited to fuels with boiling points up to 600° F. maximum. Not only does it appear that different methods may be necessary but a different set of permissible gum values may be desirable as well. The proposed methods of gum tests in their present form may exclude the use of any appreciable quantity of cracked stocks and thereby restrict the amount of jet fuels which can be made available. In Table 1 is given a resume of some of these gum studies showing a comparison between proposed JP-3 grade fuels made from straightrun stocks and straightrun cracked blends. The straightrun fuels, Nos. 73, 74, 84, 85 and 86 (Table 1) were prepared from a wide variety of crude sources. With one exception these fuels met the proposed residue and accelerated gum tests indicating that such fuels do not present much of a problem in this respect.

Three blends of cracked fuels, Nos. 75, 76, and 77 (Table 1) showed very high residue and accelerated gum values. Even if such fuels were inhibited for satisfactory storage, it is doubtful whether they would pass the proposed gum tests. Long-time storage tests with cracked fuels are necessary to establish whether they are satisfactory from a standpoint of stability.

Freezing Point

Low-temperature characteristics of jet fuels are particularly important in military service. The freezing point of —76° F. maximum in the present JP-1 grade of jet fuel and the proposed JP-3 grade (Table 2) was obviously inherited from former aviation-gasoline specifications. Comparatively little information is available indicating the maximum allowable freezing point based on actual test data of aircraft fuel systems, and this is believed necessary before any conclusions can be reached. Some work is now being started to study the effect of freezing point and cloud point on the pumpability of such fuels in aircraft fuel systems being tested in the cold room.

In addition to freezing point and cloud point of fuels, there is also a third factor, formation of ice crystals which affects the low-temperature behavior of fuels. At certain temperatures fuels may contain up to 0.015 per cent by weight of water dissolved in the fuel. As the fuel temperature is reduced, its water solubility is also reduced, producing or causing the precipitation of traces of water and finally the formation of ice crystals. Some investigations in England reported clogging of fuel filters from ice crystals at extremely low temperatures from this cause. These data also show approximately the same degree water solubility of aviation gasoline and kerosine. This situation has not been recognized as a serious problem in American aircraft and the relative freedom from this source of trouble may be attributed to different types of fuel filters. In military operation the low freezing point of jet fuel is believed desirable, although in commercial service some compromise may be made in the interest of reduction of fire hazard and fuel cost.

The ultimate estimated requirements of jet fuels for military service

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will be several times greater than for aviation gasoline. An industry-wide study has been under way to determine the quantities of such fuels which could be made available in the event of a national emergency. This study has included a variety of crudes actually produced in this country. Two conditions which were made were: (1) First priority was given for jet-fuel production; (2) existing refinery equipment would be utilized. By operating the refineries to produce the maximum quantity of each grade, the amounts which can be made available appear on Fig. 6. JP-1 grade of fuel, AN-F-32 (Table 2), is now required for all flight and ground operations of military aircraft. The quantity of this grade, essentially kerosine, which can be made available is approximately 6 per cent, which is relatively low. Freezing point and viscosity appear to be the most restrictive requirements.

Until recently grade JP-2, AN-F-34, was indicated for ground testing of jet engines. This grade was canceled a few weeks ago. The quantity of this grade which could be made available was approximately 15 per cent. Although the distillation range is wider than permitted in the JP-1 grade, other requirements of the specifications do not permit taking full advantage and hence the available quantity falls short of expectations for emergency requirements.

Specifications for a third grade, JP-3, have been drafted and it is expected ultimately to replace grade JP-1. The principal change from the JP-1 to the JP-3 grade is a much wider distillation range which has been increased to approximately 100° to 600° F. (Fig. 7) and a Reid vapor pressure of 5 to 8 lb. The quantity of the proposed JP-3 fuel which might be made available from straightrun stocks is only approximately 30 to 35 per cent, or if cracked stocks can be utilized this quantity might increase to approximately 55 per cent. The general feeling in the industry is that the proposed JP-3 grade will show satisfactory performance in the engine and will also meet the extreme low-temperature requirements, and, finally, can be made available in sufficient quantities in the event of an emergency.

Summary

The following remarks will summarize the pertinent fuel requirements of the more popular jet engines:

1. Volatility.—Fuels more volatile than JP-1, such as gasoline, offer advantages of easier starting, slightly better combustion efficiency, and smaller deposits in some engines. Less-volatile fuels, such as JP-2 grade or kerosine, offer advantages of freedom from vapor locking and evaporation losses and also reduced fire hazard.

2. Composition. — Combustion efficiency, smoke, and deposits are believed to be a function of the carbon-hydrogen ratio of the fuel component. The order of preference of fuels is paraffins, naphthenes, olefins, and aromatics. Distillate or straightrun fuels are easier to burn than cracked fuels. Much work remains to be done on the latter type.

3. Stability.—Better methods of gum test are believed necessary and much remains to be learned concerning the interpretation of these tests. It is doubtful whether much cracked stocks can be utilized with gum tests in proposed JP-3 grade of fuel.

4. Freezing point.—Military requirements emphasize the importance of very low freezing point which will have a marked effect upon the selection of jet fuel.

5. Heating value.—B.t.u.'s per gallon and not per pound is becoming the criterion. Less-volatile fuels and aromatic blends offer substantial increases in B.t.u.'s per gallon and if all other factors remain constant, range of aircraft depends upon heating value.

The selection of fuel for the jet engine involves a compromise between engine design, operating conditions, and fuel properties. For military service it appears that the type fuel required in the near future will be a wide range type (b.p. 100°-600° F.), such as the proposed JP-3 grade, for reasons of availability and performance especially under extremely low temperatures. For commercial service a less-volatile fuel (b.p. 320°-600° F. approximately) will be favored by commercial operators for reasons of reduced fire hazard. It is doubtful if jet engines will be able to utilize heavy distillate fuels such as diesel oil and gas oil because of extremely low temperatures normally encountered and the problem of designing a light-weight high-output engine to utilize such a fuel.

TABLE 1—GUM STUDY OF VARIOUS STRAIGHTRUN AND CRACKED FUELS FOR PROPOSED JP-3 SPECIFICATION

		100 per cent straightrun Fuel Nos.					Cracked-straightrun blends Fuel Nos.		
	Proposed JP-3	73	74	84	85	86	75	76	77
Air jet residue, AN-F-34	5.0	4,4	3,3	4	3	15	17,20	50	51
Accel. gum AN-F-34 (7 hr.)	...	3,3	4,3	..	11	18	125	..	140
Accel. gum AN-F-34 (16 hr.)	8.0	3,5	8	2	7	22	851	97	360
Distillation, A.S.T.M., temp. °F. e.p.	550-600	565	550	566	583	587	554	570	600

TABLE 2—DETAILED REQUIREMENTS OF EXISTING AND PROPOSED ARMY-NAVY AERONAUTICAL JET FUEL SPECIFICATIONS

Tests—	JP-1 AN-F-32	JP-2 AN-F-34	Proposed specifications, JP-3
Gravity, °A.P.I.	.....	35.0 Min.	.....
Specific gravity at 60° F.	0.850 Max.	.....	.....
Flash, Tag. closed, °F.	110 Min.	.....	.....
Viscosity, Kinematic at 100° F.	.....	0.95 Min.	.....
Viscosity, Kinematic at —40° F.	10.0 Max.	10.0 Max.	10.0 Max.
Color, Saybolt	+12 Min.	+12 Min.	.....
Corrosion, cu. strip at 212° F.	Slight Max.	Slight Max.	Pass
Sulfur, per cent	0.20 Max.	0.20 Max.	0.5 Max.
Residue, air jet, mg./100 ml.	5 Max.	5 Max.	10 Max.
Gum, accelerated, AN-F-34, 7 hr., mg./100 ml.	8 Max.	8 Max.	.....
Gum, accelerated, AN-F-34, 16 hr., mg./100 ml.	.....	.....	20 Max. (1)
Bromine No.	3.0 Max.	3.0 Max.	14 Max.
Reid vapor pressure	.....	2.0 Max.	5-7
Aromatics, vol. per cent	20 Max.	20 Max.	30 Max.
Freezing point, °F.	—76 Max.	—76 Max.	—76 Max.
Water tolerance	Sub. Im.	Sub. Im.	Sub. Im. (2)
Heat of combustion, lower valve, B.t.u./lb.	.....	.....	18,200 Min.
Distillation, Temp., °F.:			
I.b.p.	.....	150 Min.	.....
10 per cent	410 Max. Evap.	.....	.....
90 per cent	490 Max. Evap.	.....	425 Min.
End point	572 Max.	500 Max.	600 Max.
Per cent residue	1.5 Max.	1.5 Max.	1.5 Max.
Per cent loss	1.5 Max.	1.5 Max.	.....
Inhibitor content, lb. per 5,000 gal. (3))	.....	.....	1.0 Max.

(1) Method of AN-F-32, Amend. 3. (2) Substantially immiscible. (3) Approved inhibitors same as those in AN-F-48.

Acknowledgment

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STATISTICS and

WEEKLY WELL COMPLETIONS . . . WEEK ENDED JANUARY 3, 1948

	Total of all wells					Cum.		Wildcat completions and discoveries					Cumulative total, 1948				
	Comp.	Oil	Gas	Dry	Footage	1948	1947	Oil	Dist.	Gas	Dry	Total	Oil	Dist.	Gas	Dry	Total
New York	38	19	0	*19	39,012	38	21	0	0	0	0	0	0	0	0	0	0
Pennsylvania	66	31	3	†32	104,524	66	48	0	0	0	2	2	0	0	0	2	2
West Virginia	4	0	2	2	16,872	4	4	0	0	2	2	4	0	0	2	2	4
Ohio	26	6	12	‡8	70,520	26	24	0	0	1	0	1	0	0	1	0	1
Indiana	10	6	0	4	18,654	10	14	0	0	0	0	0	0	0	0	0	0
Kentucky	14	6	0	8	21,430	14	6	0	0	0	0	0	0	0	0	0	0
Illinois	50	25	0	25	133,964	50	45	0	0	0	8	8	0	0	0	8	8
Michigan	20	6	2	12	51,465	20	20	0	0	0	7	7	0	0	0	7	7
Kansas	47	32	6	§9	151,091	47	59	0	0	0	0	0	0	0	0	0	0
Neb., Mo., Iowa	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Oklahoma	57	32	1	24	223,062	57	70	0	0	0	3	3	0	0	0	3	3
Texas	163	94	13	56	717,787	163	95	4	0	1	36	41	4	0	1	36	41
North Central (Dist. 7-B & 9)	50	25	0	25	152,494	50	46	2	0	0	19	21	2	0	0	19	21
West (Dist. 7-C & 8)	44	36	0	8	216,323	44	14	0	0	0	0	0	0	0	0	0	0
Panhandle (Dist. 10)	18	11	7	0	53,750	18	0	0	0	0	0	0	0	0	0	0	0
Eastern (Dist. 5 & 6)	16	9	3	4	94,441	16	0	1	0	0	2	3	1	0	0	2	3
Gulf Coast (Dist. 2 & 3)	16	7	0	9	98,540	16	25	1	0	0	6	7	1	0	0	6	7
Southwest (Dist. 1 & 4)	19	6	3	10	102,239	19	10	0	0	1	9	10	0	0	1	9	10
Louisiana	51	32	5	14	206,192	51	9	0	0	0	3	3	0	0	0	3	3
Northern	39	25	3	11	128,856	39	0	0	0	0	3	3	0	0	0	3	3
Southern	12	7	2	3	77,336	12	0	0	0	0	0	0	0	0	0	0	0
Arkansas	9	8	0	1	39,521	9	0	1	0	0	0	1	1	0	0	0	1
Mississippi	7	4	0	3	46,084	7	5	1	0	0	1	2	1	0	0	1	2
Southeastern States	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0
Montana	8	5	1	2	18,743	8	2	0	0	0	1	1	0	0	0	1	1
Wyoming	2	1	0	1	6,461	2	9	0	0	0	0	0	0	0	0	0	0
Colorado-Utah	3	3	0	0	19,305	3	8	0	0	0	0	0	0	0	0	0	0
New Mexico	11	9	0	2	47,545	11	0	0	0	0	0	0	0	0	0	0	0
California	44	41	0	3	191,473	44	40	0	0	0	3	3	0	0	0	3	3
Total United States	630	360	45	225	2,123,705	630	480	6	0	4	66	76	6	0	4	66	76
Total previous week	657	354	41	262	2,128,008	33,177	28,769	7	0	4	66	77	682	88	226	4,109	5,105
Total January 4, 1947	490	265	40	175	1,629,856			10	0	1	52	63	10	0	1	52	63

Service wells included: *19, †30, ‡3, §1.

CRUDE PRICES AND REFINERY ACTIVITY

GRAVITY SCHEDULES

Top prices include all gravities above grades designated, and low prices include all gravities below grades designated.

Gravity—	Signal Hill, Calif.	Okla-homa, Kansas	Gulf Coast Tex.†	West Tex.‡
18-18.9	$2.17	....	....	....
19-19.9	2.19	....	....	....
20-20.9	2.21	$2.25	....	$2.12
21-21.9	2.23	2.27	....	2.14
22-22.9	2.27	2.29	....	2.16
23-23.9	2.30	2.31	....	2.18
24-24.9	2.34	2.33	$2.56	2.20
25-25.9	2.38	2.35	2.58	2.22
26-26.9	2.41	2.37	2.60	2.24
27-27.9	2.45	2.39	2.62	2.26
28-28.9	2.49	2.41	2.64	2.28
29-29.9	2.52	2.43	2.66	2.30
30-30.9	2.56	2.45	2.68	2.32
31-31.9	2.59	2.47	2.70	2.34
32-32.9	2.62	2.49	2.72	2.36
33-33.9	....	2.51	2.74	2.38
34-34.9	....	2.53	2.76	2.40
35-35.9	....	2.55	2.78	2.42
36-36.9	....	2.57	2.80	2.44
37-37.9	....	2.59	2.82	2.46
38-38.9	....	2.61	2.84	2.48
39-39.9	....	2.63	2.86	2.50
40 and above	....	2.65	2.88	2.52

†For crude from Daboval, El Campo, and Sand Point. ‡Includes Lea County, New Mexico.

A.P.I. REFINERY REPORT, WEEK ENDED DECEMBER 27

(Thousands of barrels)

District—	Crude runs, daily avg.	Production: Gasoline†	Kerosine	Gas & dist. oil	Residual	Stocks at refineries, bulk terminals, in transit and in pipe lines: Gasoline*	Kerosine	Gas & dist. oil	Residual
East Coast	856	2,054	309	1,136	1,681	19,516	6,160	13,282	7,300
Appalachian:									
District 1	104	340	65	67	92	2,169	422	595	417
District 2	69	241	22	75	109	1,024	123	284	175
Ind., Ill., Ky.	893	3,052	444	1,046	1,256	16,720	2,515	7,016	5,010
Okla., Kans., Mo.	465	1,672	145	558	523	8,374	901	3,217	1,612
Inland Texas	265	1,124	115	185	492	3,136	494	497	698
Texas Gulf Coast	1,383	4,323	676	1,956	2,077	15,795	2,558	7,888	7,101
La. Gulf Coast	418	1,201	444	694	540	5,009	1,692	2,673	2,086
N. La. and Ark.	81	204	58	71	130	1,572	359	393	174
Rocky Mountain:									
New Mexico	10	29	3	8	23	80	25	24	23
Other Rocky Mtn.	137	385	24	147	279	1,907	137	814	672
California	862	2,388	29	1,098	2,496	15,967	1,007	13,641	26,623
December 27, 1947	5,543	17,013	2,334	7,041	9,698	91,269	16,393	50,324	51,896
December 20, 1947	5,246	16,006	2,291	6,520	8,643	87,056	16,866	51,502	52,113
December 28, 1946	4,932	15,556	2,113	6,000	8,147	91,851	17,338	60,304	52,922

*Finished and unfinished. †At refineries including natural blended.

Bureau of Mines crude-oil stocks 222,921,000 bbl. as of December 20—down 553,000 bbl. One year ago 226,111,000 bbl.

FLAT CRUDE PRICES

Representative posted schedules per bbl.	
East Texas	$2.65
Kettleman Hills, California*	2.14
Beauregard Parish	2.60
Illinois Basin	2.77
Pecos County, Texas (Yates)	1.85
Bradford, Pennsylvania	5.00
Eastern Ill. and Western Ind.†	2.77
Tomball, Texas Gulf Coast	2.83

*37°-37.9°. †35° and above.

TRENDS

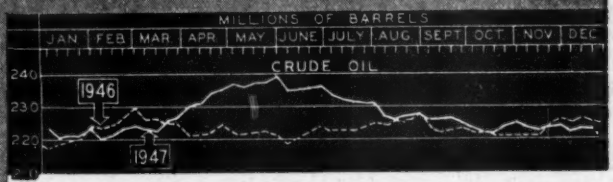
DAILY AVERAGE PRODUCTION FOR WEEK

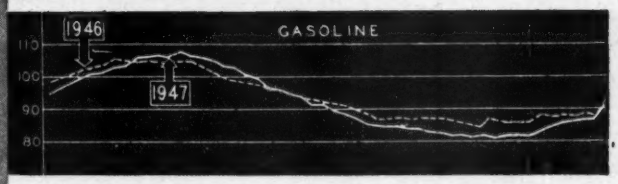
	Jan. 3 crude oil	B. of M. Dec. demand	Dec. 27 crude oil
Alabama	1,250	1,500	1,400
Arkansas	87,500	82,000	87,000
California	930,300	930,000	931,600
Colorado	46,950	47,000	47,200
Eastern	57,400	64,600	60,800
Florida	725	1,000	625
Illinois	173,800	195,000	177,400
Indiana	17,500	17,300	18,100
Kansas	286,250	306,000	295,550
Kentucky	27,900	26,000	28,700
Louisiana	469,075	446,000	465,075
North Louisiana	120,200	.....	120,050
South Louisiana	348,875	.....	345,025
Michigan	47,800	45,000	48,500
Mississippi	110,350	100,000	112,110
Montana	23,560	24,000	24,860
Nebraska	500	600	500
New Mexico	121,300	120,000	119,950
Oklahoma	404,950	405,000	409,300
Texas	2,364,500	2,300,000	2,348,600
Dist. 1 (Southwest)	25,175	.....	24,850
Dist. 2 (Southwest)	165,750	.....	163,825
Dist. 4 (Southwest)	256,925	.....	258,000
Dist. 3 (Gulf Coast)	491,750	.....	488,000
Dist. 5 (Eastern)	43,075	.....	42,275
Dist. 6 (Eastern)	120,125	.....	119,575
East Texas Field	294,200	.....	294,000
Dist. 7-C (West)	42,025	.....	41,385
Dist. 8 (West)	653,250	.....	648,750
Dist. 7-B (W. Central)	42,475	.....	42,100
Dist. 9 (N. Central)	139,250	.....	136,625
Dist. 10 (Panhandle)	90,500	.....	89,215
Wyoming	130,750	125,000	133,550
Total United States	*5,302,360	5,236,000	5,310,820
Change from prev. wk., dn.	8,460		

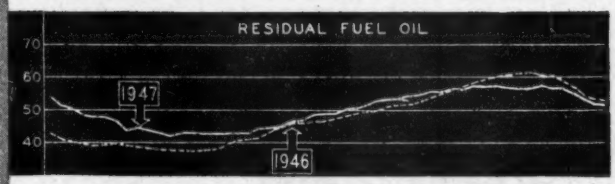
Total production January 1-January 3..... †15,907,080 bbl.
Same period last year (crude plus cond.).. 14,128,005 bbl.

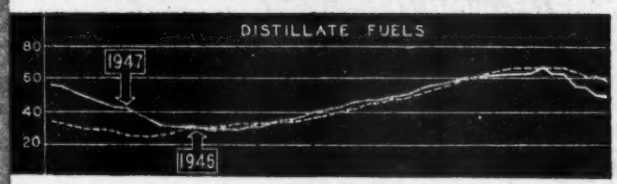
*Not incl. 47,730 bbl. condensate. †Incl. 143,190 bbl. condensate.

OIL STOCKS IN THE UNITED STATES

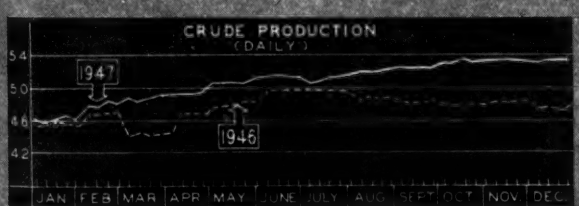


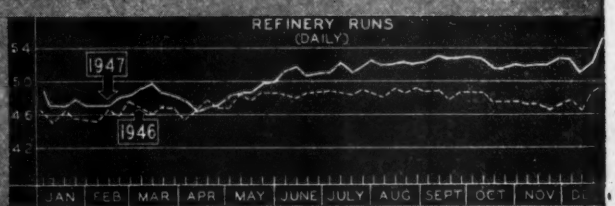




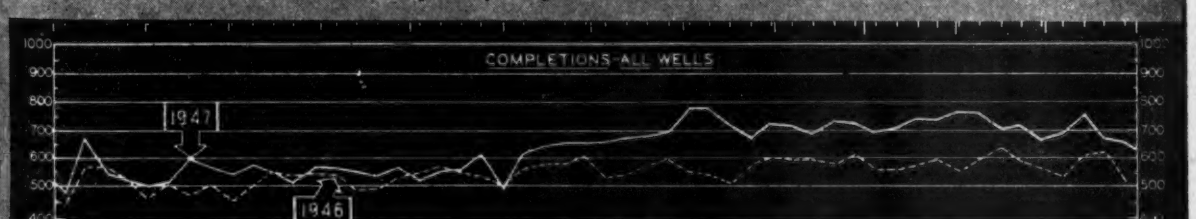


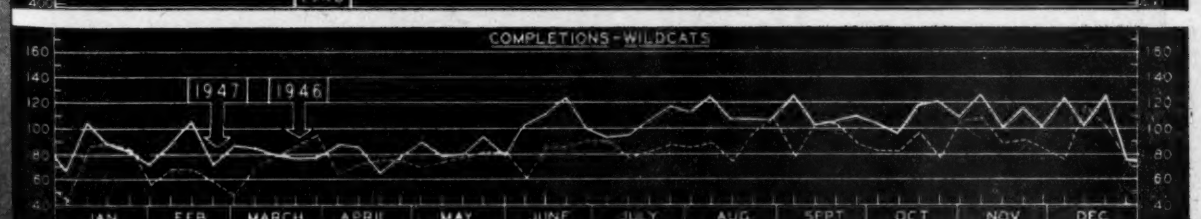
DAILY OPERATIONS





Solid line charts weekly completions, service wells in Eastern area included.





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MARKETS

IN New York harbor kerosine was offered at prices approximating 17 cents per gallon and No. 2 fuel oil at around 15 cents per gallon. These were not, however, representative of most suppliers in this area, but some observers regarded these prices as indicating generally higher price levels.

One small fuel-oil distributor in the New York area is delivering heavy fuel oil for the account of New York's Board of Transportation at a price of $6.20 per barrel. Previously the Board of Transportation had purchased 125,000 bbl. at $3.75 a barrel. The current delivery is for 5,000 bbl. in barges. The posted price in New York ranges from $3 to $3.90 per barrel. This particular supplier obtained the oil from a broker "at a fancy price."

Conservation Spreading

A particularly strong effort for fuel conservation is being concentrated especially on the Atlantic seaboard. Ten Eastern and New England states have recently set up either fuel coordinators or have arranged for picked committees to do the same job. In the Philadelphia area leading oil distributors have agreed to limit household purchasers to 100 gal. of fuel oil at a time and then only if their supply is at a critically low level.

One large supplier on the East Coast early this week urged its heating-fuel customers in New York and New England to reduce their consumption of fuel oil during the winter months by 15 per cent to conserve supplies.

Material was reported nearly nonexistent on the spot tank-car market in the Houston area last week. All types of products continued to command substantial premiums on the open market.

Marketing officials heard reports on a likely upward revision in posted prices for lubricating oils, to occur in the near future. The lube group has not yet advanced with the recent 50-cent crude-oil-price increase.

At Texas City a prolonged strike at Pan American Refining Corp. would be reflected in the already short supply of products in East Coast areas. Pan American is a subsidiary of Pan American Petroleum & Transport Co. and most of its products go to the East for marketing through Lord Baltimore Filling Stations and American Oil Co., also Pan American subsidiaries.

Demand Heavy

In the Mid-Continent area slightly increased postings of gasoline prices were reported by some buyers last week. Heating oils continued strong and demand for all products continued to outstrip supply. Premiums continued high and some suppliers reported that buyers just wanted delivery, that "price is no object." No loosening in the tank-car situation was seen and deliveries were falling behind because of their scarcity.

In view of the latest 10 per cent increase in freight rates granted rail and water carriers on commodities generally, including petroleum, there was considerable speculation that tank-wagon and retail price advances would be forthcoming.

While New York State's fuel-oil coordinator has announced that major fuel-oil distributors there have agreed to a program whereby fuel-oil deliveries will be cut 15 per cent immediately, the mayor has indicated that the city will take over fuel-oil deliveries if there is any additional evidence of a black market in fuel-oil sales.

Representative Quotations

Representative spot-market quotations of leading suppliers as of January 5, 1948. Figures are f.o.b. plant for tank-car shipment in cents per gallon, except for residual fuel oil which shows the price per barrel and wax, in cents per pound.

GASOLINE, KEROSINE, AND FUEL OILS

	Mid-Continent Group 3	New York Harbor	Texas Gulf Coast
Regular gasoline, 73-75 octane	10½-11½	10.6-12* 9 6-11.1†	10.9-13
Premium gasoline, 78-80 octane	11¾-12½	10.6-13.4	12.9-13½
42-44 w.w. kerosine	10-10½	8.6-10.5	10¼-11½
No. 2 straw fuel oil	9½-11	7.6-9.6	9.05-11¼
No. 6 residual	$2.50-2.90	$2.55-3.24	$2.56-3.25

*Branded (74-76 octane); †Unbranded (74-76 octane).

NATURAL GASOLINE

	Group 3	North Texas	N. La.
Grade 26-70	8½	8	8¼
Grade 18-55	10.2	9.6	9.9

LUBRICATING OILS

South Texas

200 vis., No. 2-3 neutral	11-13¾
750 vis., No. 3-4 neutral	13-16⅝
2,000 No. 5-6 neutral	14-18½

LUBRICATING OILS

Mid-Continent

150-160 vis., D bright stock, 0-10 pp.	30-33
200 vis. No. 3 neutral, 0-10 pp.	20-21

Western Pennsylvania

145-155 vis. 10 p.t. bright stock	47
180 vis. p.t. neutral	46

CRUDE-SCALE WAX

Mid-Continent

130-132 A.S.T.M. melting point	8½-9¼

EQUIPMENT MEN ... in the News

Jacobs Named Purchasing Agent

A. L. JACOBS

A. Lewis Jacobs, employed in the cost accounting department of Mission Manufacturing Co. in 1936, has been promoted to purchasing agent of that Houston manufacturing concern. He replaces Jeff Tucker, who is now in the sales department and is export sales manager in Mission's New York office.

Paul Franks, who has been a buyer in the purchasing department, was named assistant purchasing agent, and Robert Anschutz, formerly assistant cost accountant, was made head of the cost accounting department.

Kauffman to Speak In Canada

Virgil Kauffman, president of Aero Service Corp., Philadelphia, will be one of the featured speakers at the annual meeting of Canadian Institute of Surveying at the Chateau Laurier, Ottawa, on February 4 and 5. Kauffman's subject will be "The Airborne Magnetometer."

Aero Service Corp. has long been known for its photogrammetric work, In 1944 Kauffman became interested in the new airborne magnetometer as an exploration tool and made available a plane and pilot from his company for the early U. S. Navy-Geological Survey tests then being conducted. Since that time the company has made numerous other surveys for ore and oil, the largest oil survey being a regional study of the Bahamas for five major oil companies.

G.E. Promotions to Erben, Lockton

Henry V. Erben has been elected a vice president by the board of directors of the General Electric Co., effective January 1, and on that date becomes general manager of the apparatus department, largest of the seven G.E. operating departments.

He succeeds Roy C. Muir, company vice president, who is retiring after more than 42 years' service.

John D. Lockton has been elected treasurer of the company effective January 1, succeeding Jesse W. Lewis of New York who is retiring after 37 years of service.

Erben is now a commercial vice president and assistant general manager of the apparatus department, and Lockton is an assistant treasurer.

Du Pont Promotes Brown and Baker

Du Pont Co., Wilmington, Del., announces the promotion of Harry F. Brown to general manager of its explosives department and Samuel G. Baker to general manager of its electrochemicals department. Both men have been assistant general managers of the departments they will head, effective January 1. Brown succeeds William H. Ward, who was elected a vice president of the company, and Baker succeeds F. S. MacGregor, who is retiring after a successful career of 31 years.

International Nickel Advance Five

Ralph D. Parker and J. Roy Gordon, of Copper Cliff, Ont., and Herbert G. Fales, of New York, have been elected assistant vice presidents of International Nickel Co. of Canada, Ltd.

At the same time Walter C. Kerrigan, James F. McNamara, and T. H. Wickenden were elected vice presidents of the company's United States subsidiary, International Nickel Co., Inc.

Calumet & Hecla Elects Vice Presidents

Calumet & Hecla Consolidated Copper Co. announces the election of three vice presidents, effective January 2, 1948. They are A. E. Petermann, general counsel; H. Y. Bassett, general manager of the Wolverine Tube Division; and A. H. Wohlrab, general manager of the Calumet Division.

Robert Livermore of Boston retired as vice president on December 31, 1947, but will remain as a director.

Lincoln Electric Appoints Koykka

Thomas V. Koykka has been appointed to the board of directors of Lincoln Electric Co., Cleveland, to serve until the next annual election. Koykka is a partner in the law firm of McKeehan, Merrick, Arter & Stewart and Geo. Wm. Cottrell.

Tracerlab Appoints Schreiber

Alan P. Schreiber has been appointed to the sales staff of Tracerlab, Inc., Boston. Schreiber will be in charge of sales contacts with the chemical industry for new equipment, processed radioisotopes, and the development of industrial uses for redioactivity. He will also act as editor of Tracerlog, the monthly technical publication of Tracerlab, Inc.

Discussing cargo loads at the large cargo doors of the completed Mene Grande executive-cargo ship recently converted by Dallas Aero Service, Dallas, are J. R. Brightwell, Dallas, a former associate of Mene Grande Oil Co.; H. B. Sutton, superintendent of maintenance, Dallas Aero Service; Sebastain J. Lo Presti, copilot Mene Grande Oil Co.; and Gordon W. Silva, chief pilot, Mene Grande Oil Co.

Growth of Petrochemical Industry Shown by Government Report

WASHINGTON. — Production of chemicals from petroleum and natural gas continues to increase rapidly and in 1946 the output was more than double that of 1943, it is disclosed by a report on synthetic organic chemicals just compiled by the United States Tariff Commission.

Production of crude and intermediate petroleum chemicals totaled 3.5 billion pounds in 1946, compared with 3.3 billion pounds in 1945, 2.8 billion pounds in 1944, and 1.5 billion pounds in 1943, the report states. The increase was due to a larger output of aliphatic hydrocarbons, chiefly butadiene for use in synthetic rubber, and propane and propylene for the manufacture of isopropyl alcohol and other chemicals.

The bulk of the report is devoted to statistics on coal-tar chemicals, but data on petroleum chemicals are summarized in Table 1.

In discussing these statistics the report says:

"Considerable duplication is involved in the statistics on total production and sales of crudes from petroleum and natural gas, particularly the hydrocarbons. This duplication arises from the practice of some producers of converting one crude into another crude and reporting to the commission the output of both products. Another qualification of the statistics given in this report must be noted; namely, that with respect to certain petroleum and natural-gas products the reported production for chemical conversion is somewhat understated. This understatement arises as follows: Statistics of production of crudes sold for use as fuel are not reported to the commission and are not therefore included in the data given in this report. Some of the crudes sold for use as fuel are, however, not so used but are converted to finished products. Thus the statistics given herein for production of crudes for chemical conversion are understated by the amount that the crudes sold for fuel are actually converted to finished products. Notwithstanding these qualifications, the statistics given in this report, both on crudes and on finished products, are sufficiently accurate to indicate trends and for purposes of general comparison. . . .

"Production of aromatics and naphthenes from petroleum decreased sharply in 1946, compared with the preceding years. The decline of 246

(Continued on page 119)

TABLE 1—ORGANIC CHEMICALS: UNITED STATES PRODUCTION AND SALES OF CRUDE PRODUCTS FROM PETROLEUM AND NATURAL GAS FOR CHEMICAL CONVERSION, 1946

Product—	Production, 1,000 lb.	Sales		
		Quantity, 1,000 lb.	Value, 1,000 dollars	Unit value Per lb.
Aromatics and naphthenes*—				
Total	599,572	570,635	11,580	.02
Cresylic acid, crude	(†)	(†)	(†)	...
Naphthenic acid, total	28,897	24,323	1,476	.06
Acid number less than 200‡	14,525	9,066	122	.01
Acid number 200 or more	14,372	15,257	1,354	.09
Toluene, all grades§	67,443	87,568	2,303	.03
Xylene, all grades¶	263,125	222,685	5,331	.02
All other aromatics	240,107	236,059	2,470	.01
Aliphatic hydrocarbons—				
Total	2,917,155	2,638,254	155,440	.06
C_2 hydrocarbons: ethylene	294,605	(‖)	(‖)	...
C_3 hydrocarbons: propane and propylene	208,620	172,076	2,863	.02
C_4 hydrocarbons, total	2,186,806	2,090,482	141,981	.07
1,3-Butadiene, grade for rubber[a]	1,074,040	1,083,348	111,872	.10
1-Butene and 2-butene fraction	632,056	632,056	12,631	.02
All other	480,710	375,078	17,478	.05
C_5 hydrocarbons	42,273	31,205	1,740	.06
All other aliphatic hydrocarbons	184,851	344,491	8,856	.03
Grand total	3,516,727	3,208,889	167,020	$0.05

*The chemical raw materials designated as aromatics from petroleum may include some compounds identical with those obtained by the carbonization of coal or the processing of coal tar; those derived from coal tar, however, are excluded from this table. †Data included in "all other aromatics" in order to prevent the disclosure of the operations of individual producers. In 1946, production of cresylic acid, crude, from petroleum and coal tar combined amounted to 20,065,000 lb.; total sales were 6,259,000 lb., valued at $254,000. ‡Includes crude sodium nephthenate. §Data on toluene from coal tar not included. Total United States production from all sources was 243,000,000 lb. (33,499,000 gal.); sales were 256,000,000 lb. (35,404,000 gal.) valued at $7,192,000. ¶Data on xylene from coal tar are not included. Total United States production from all sources was 322,000,000 lb. (44,616,000 gal.); sales were 281,000,000 lb. (38,945,000 gal) valued at $7,179,000. ‖Data on ethylene from other sources are not included. Total United States production was 307,495,000 lb.; sales were 165,060,000 lb., valued at $7,231,000. [a]Includes quantity of butadiene produced from alcohol.

Note.—These data may not be complete since some crude C_3 and C_4 cuts may be sold as fuel but later converted by purchasers to petroleum chemicals.

TABLE 2—SYNTHETIC ORGANIC CHEMICALS: UNITED STATES PRODUCTION AND SALES OF ELASTOMERS,* 1946

Chemical—	Production, 1,000 lb.	Sales†		
		Quantity, 1,000 lb.	Value, 1,000 dollars	Unit value Per lb.
Elastomers, cyclic—				
Total	1,379,411	1,548,275	288,473	.19
Polybutadiene-styrene, total	1,377,517	1,546,425	288,131	.19
Produced at government plants‡	1,370,890	1,539,411	284,753	.18
Produced at private plants	6,627	7,014	3,378	.48
Polystyrene-isoprene§	1,894	1,850	342	.18
Elastomers, acyclic—				
Total	328,373	334,818	83,481	.25
Polybutadiene-acrylonitrile (GR-A type)	13,615	14,751	5,647	.38
Polychloroprene (GR-M type)§	83,199	83,666	22,666	.27
Polyisobutylene-diolefin (GR-I type)§¶	163,777	169,365	27,971	.17
All other acyclic elastomers‖	67,782	67,036	27,197	.41
Grand total	1,707,784	1,883,093	371,954	$0.20

*An elastomer is defined as a material which will stretch repeatedly to 150 per cent or more and will return rapidly and with force to its approximate original shape. Synthetic elastomers include synthetic rubbers. †Value of sales for some plants operated for the Rubber Reserve Co. represent the value calculated from the quantity of sales and the average book value per pound for 1946 as supplied by the Office of Rubber Reserve, Reconstruction Finance Corp. ‡In addition, plant operated for Polymer Corp., Ltd., a Canadian Government corporation produced 86,484,000 lb. and sold 85,649,000 lb., valued at $16,819,000. §Data for government plant only. ¶In addition, plant operated for Polymer Corp., Ltd., a Canadian Government corporation produced 27,230,000 lb. and sold 28,066,000 lb., valued at $5,420,000. ‖Includes statistics for some of the plastics materials which have been converted by the addition of plasticizers into elastomers, such as certain polyvinyl polymers and copolymers, polyalkalene sulfide, polychloroprene, polyisobutylene, polyisoprene, silicone, and cyclo- and chlorinated rubbers, all of which were produced in privately owned plants.

LES OF

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